United States
Environmental Protection
Agency

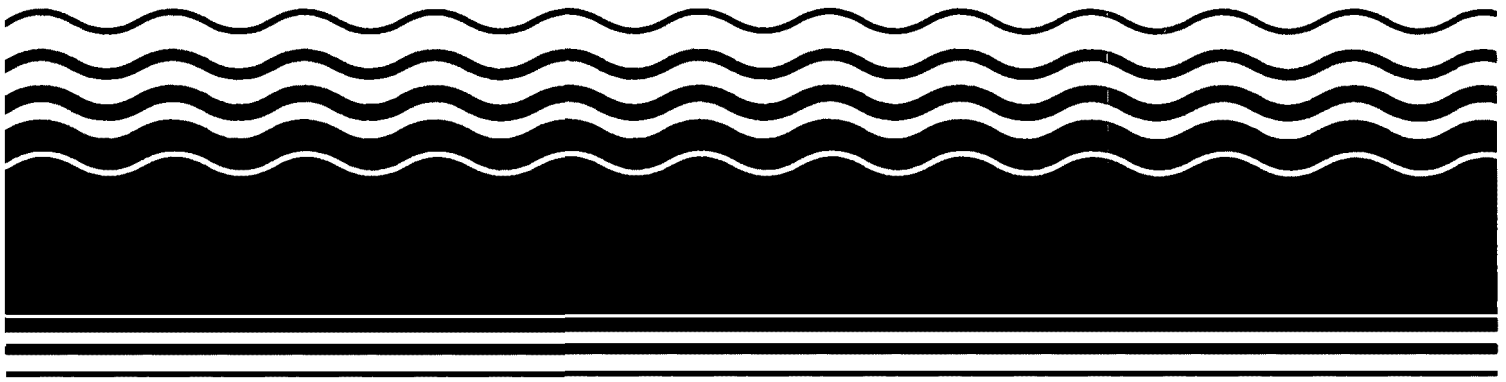
Office of
Emergency and
Remedial Response

EPA/ROD/R02-92/193
March 1992
PB93-963826

EPA

Superfund Record of Decision:

Naval Air Engineering Center (Operable Unit 7), NJ



50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R02-92/193	2.	3. Recipient's Accession No.

4. Title and Subtitle
SUPERFUND RECORD OF DECISION
Naval Air Engineering Center (Operable Unit 7), NJ
Seventh Remedial Action - Interim

5. Report Date 03/16/92

6.

7. Author(s)

8. Performing Organization Rept. No.

9. Performing Orgainization Name and Address

10. Project/Task/Work Unit No.

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

13. Type of Report & Period Covered 800/000

14.

15. Supplementary Notes
PB93-963826

16. Abstract (Limit: 200 words)

The 7,400-acre Naval Air Engineering Center (NAEC) site is located in Jackson and Manchester Townships, Ocean County, New Jersey, approximately 14 miles inland from the Atlantic Ocean. Surrounding land use is primarily undeveloped woodlands and open areas, with the closest residential area, the Borough of Lakehurst, located southeast of the facility. The NAEC, which lies within the Toms River Drainage Basin, contains over 1,300 acres of flood-prone areas. In the vicinity of NAEC, drinking water is generally supplied to the populace by municipal supply wells. Some private wells exist, but these are primarily used for irrigation purposes. The U.S. Navy assumed control of the property in 1919, and it was formally commissioned Naval Air Station (NAS) Lakehurst in 1921. The NAEC was moved from the Naval Base, Philadelphia to NAS Lakehurst in 1974. NAEC's mission is to conduct research, development, engineering, testing and system integration, limited production and procurement for aircraft and airborne weapons systems. Historically, various operations at NAEC have required the use, handling, storage, and occasional onsite disposal of hazardous substances. The U.S. Air Force's Installation Restoration Program (IRP) has identified 44 potentially

(See Attached Page)

17. Document Analysis a. Descriptors
Record of Decision - Naval Air Engineering Center (Operable Unit 7), NJ
Seventh Remedial Action - Interim
Contaminated Media: soil, gw
Key Contaminants: VOCs (benzene, PCE, TCE, toluene, xylenes), other organics (PAHs, PCBs), metals

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 58
	20. Security Class (This Page) None	22. Price

Abstract (Continued)

contaminated sites at NAEC, 16 of which have warranted further investigation to assess potential impacts. Several of these sites are located within Areas A and B of the northeastern section of NAEC, where ground water has been found to be contaminated with VOCs. Area A is subdivided into two sections: Area A-East, including Sites 14, 29, and 37; and Area A-West, including Sites 12, 33, and 42. A wetland area is adjacent to the northern edge of Area A. Area B, located immediately south of Area A, includes Sites 9, 13, 36, and 39 as well as Hangars 1, 2, and 3. Several reported or potential contaminant sources may have contributed to the ground water contamination beneath Areas A-East and B, including releases of mixed liquid wastes from fire-fighting pits during training activities (A-East), surface disposal of jet fuel and gasoline (A-East), spills and leaks at former drum storage area (A-East), leakage and spills from former underground storage tanks (Area B), and releases from a dry well receiving unknown liquids at northeast corner of Hangar 1 (Area B). Reported or potential contaminant sources at the sites in Area A-West include leakage from two former underground storage tanks (Site 12), releases from a former dry cleaning facility (Site 12), discharges from a dry well that received mixed liquid waste (Site 33), and surface disposal of mixed wastes in a landfill (Site 42). Six previous RODs have addressed other OUs at NAEC. This ROD addresses an interim remedy for the principal threat at the site, migration of the contaminated groundwater plume from Areas A and B. A future ROD will address a final remedy for ground water and any other areas of contamination in Areas A and B. The primary contaminants of concern affecting the soil and ground water at the site are VOCs, including benzene, PCE, TCE, toluene, and xylenes; other organics including PAHs and PCBS; and metals.

The selected remedial action for this site includes extracting and pretreating contaminated ground water from six recovery wells to remove metals, solids, and free product; transporting the free product offsite for recycling or disposal; treating ground water onsite using air stripping and granular activated carbon to remove VOCs, with discharge of the treated water onsite to the aquifer through an irrigation and infiltration system; spray irrigating the treated water over areas of subsurface soil contamination to facilitate soil flushing and removal of soil contaminants; treating air emissions from the air stripping process using granular activated carbon, prior to discharge to the atmosphere; testing residual sludge from the pretreatment processes for hazardous waste characteristics and sending this offsite for appropriate disposal; and returning spent carbon offsite to the vendor for regeneration. The estimated present worth cost for this remedial action is $4,015,000, which includes an annual O&M cost of $400,000 for 3 years.

PERFORMANCE STANDARDS OR GOALS:

Chemical specific clean-up levels for ground water and soil have not been identified because of the interim nature of this remedial action. Clean-up goals will be established when a final remedial action is chosen. Treatment residuals will be tested to determine whether RCRA Land Disposal Restrictions apply.

ROD FACT SHEET FOR NAEC LAKEHURST
OPERABLE UNIT 7

SITE	
Name	NAEC Lakehurst
Location/State	Ocean County, New Jersey
EPA Region	II
HRS Score (date)	49.48 (July 22, 1987)
NPL Rank (date)	Group 4 (July 22, 1987)

ROD	(OU 7 - Area A and B - Interim Action)
Date Signed	March 16, 1992
Remedy/ies	Ground water pump and treat system
Capital Cost	$2,885,405
O & M/year	$ 400,000/yr for 3 years
Present worth	$4,015,000

LEAD	
Remdial/Enforcement	Federal Facility
EPA/State/PRP	Navy
Primary contact (phone)	Jeff Gratz 212-264-6667
Secondary cont. (phone)	Robert Wing 212-264-8670
Main PRP(s)	Navy
PRP Contact (phone)	Ms. Lucy Bottomley

WASTE	
Type (metals, PCB, &c)	jet fuel (B,T,E,X) and solvents
Medium (soil, g.w., &c)	Ground water
Origin	Dry wells, USTs, and spills
Est. quantity	Ground water plume length - 2,000 ft width - 800 ft depth - 50 ft

RECORD OF DECISION

FOR
THE INTERIM REMEDIAL
ACTION
AT
AREAS A AND B

NAVAL AIR ENGINEERING CENTER
LAKEHURST, NEW JERSEY
DECEMBER 20,1991

RECORD OF DECISION
DECLARATION STATEMENT
AREAS A AND B
NAVAL AIR ENGINEERING CENTER

FACILITY NAME AND LOCATION

Naval Air Engineering Center
Lakehurst, New Jersey 08733

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected interim remedial action for Areas A and B located at the Naval Air Engineering Center (NAEC) in Lakehurst, New Jersey. The interim remedial action was chosen in accordance with the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for Areas A and B.

Both the United States Environmental Protection Agency (USEPA), Region II Acting Administrator and the Commissioner of the New Jersey Department of Environmental Protection and Energy (NJDEPE) concur with the selected interim remedy.

ASSESSMENT OF THE AREA

The actual or threatened release of hazardous substances in Areas A and B, if not addressed by implementing the response action selected in this Record

of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare or the environment.

DESCRIPTION OF THE REMEDY

The selected interim remedial action addresses the principal threat of the migration of a plume of contaminated groundwater from Areas A and B by pumping and treating the groundwater and removing residual amounts of floating fuel product from the groundwater. The selected remedy for Areas A and B, located in the northeastern corner of NAEC, includes the following components:

- Groundwater extraction from six recovery wells (at a total rate of approximately 585 gallons/minute), pretreatment to remove metals, solids and residual amounts of free fuel product from groundwater and treatment by a combination of air stripping and carbon adsorption to remove volatile organic compounds (VOCs).

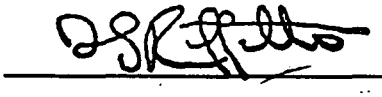
- Effluent water from the air stripper is "polished" using a granulated activated carbon (GAC) filter to further reduce VOCs and semi-volatile organic compounds (SVOCs). A GAC air filter is used to treat the emissions from the air stripper.

- Treated water meeting New Jersey Department of Environmental Protection and Energy Discharge Effluent Limitations is spray irrigated during temperate weather and infiltrated into the soil during winter months. During temperate periods, much of the spray irrigation will occur over areas of known subsurface soil contamination, although during winter months, infiltration will generally occur upgradient of these areas. Irrigation and infiltration will flush and aerate the soil, to increase

biological activity and promote contaminant decomposition in area of soil contamination.

STATUTORY DETERMINATIONS

This interim action is protective of human health and the environment, and attains action-specific Federal and State applicable or relevant and appropriate requirements (ARARs) directly associated with this remedy. Because the scope and role of this action is limited, chemical-specific cleanup levels will not be addressed during the interim action, but will be addressed during the final remedy for Areas A and B. This action satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility or volume of hazardous substances, pollutants, and contaminants as a principal element. However, this action does not constitute the final remedy and subsequent actions are planned to fully address the problems posed by this area.

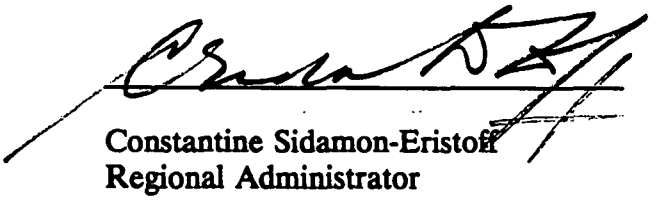


14 Jan 92

Captain David Raffetto
Commanding Officer
Naval Air Engineering Center
Lakehurst, New Jersey

(Date)

With the concurrence of:



16 March 1992

Constantine Sidamon-Eristoff
Regional Administrator
U.S. Environmental Protection Agency, Region II

(Date)

SITE DESCRIPTION

NAEC is located in Jackson and Manchester Townships, Ocean County, New Jersey, approximately 14 miles inland from the Atlantic Ocean (Figure 1). NAEC is approximately 7,400 acres and is bordered by Route 547 to the east, the Fort Dix Military Reservation to the west, woodland to the north (portions of which are within Colliers Mill Wildlife Management Area), Lakehurst Borough and woodland, including the Manchester Wildlife Management Area, to the south. NAEC and the surrounding area are located within the Pinelands National Reserve, the most extensive undeveloped land tract of the Middle Atlantic Seaboard.

NAEC lies within the Outer Coastal Plain physiographic province, which is characterized by gently rolling terrain with minimal relief. Surface elevations within NAEC range from a low of approximately 60 feet above mean sea level in the east-central part of the base, to a high of approximately 190 feet above mean sea level in the southwestern part of the base. Maximum relief occurs in the southwestern part of the base because of its proximity to the more rolling terrain of the Inner Coastal Plain. Surface slopes are generally less than five percent.

NAEC lies within the Toms River Drainage Basin. The basin is relatively small (191 square miles) and the residence time for surface drainage waters is short. Drainage from NAEC discharges to the Ridgeway Branch to the north and to the Black and Union Branches to the south. All three streams discharge into the Toms River. Several headwater tributaries to these branches originate at NAEC. Northern tributaries to the Ridgeway Branch include the Elisha, Success, Harris and Obhanan Ridgeway Branches. The southern tributaries to the Black and Union Branches include the North Ruckles and Middle Ruckles Branches and Manapaqua Brook. The Ridgeway and Union Branches then feed Pine Lake; located approximately 2.5 miles east of NAEC before joining Toms river. Storm drainage from NAEC is divided between the north and south, discharging into the Ridgeway Branch and Union Branch,

respectively. The Paint Branch, located in the east-central part of the base, is a relatively small stream which feeds the Manapaqua Brook.

Three small water bodies are located in the western portion of NAEC: Bass Lake, Clubhouse Lake, and Pickerel Pond. NAEC also contains over 1,300 acres of flood-prone areas, occurring primarily in the south-central part of the base, and approximately 1,300 acres of prime agricultural land in the western portion of the base.

There are 913 acres on the eastern portion of NAEC that lie within Manchester Township and the remaining acreage is in Jackson Township. The combined population of Lakehurst Borough, Manchester and Jackson Townships, is approximately 65,400, for an area of approximately 185 square miles. The average population density of Manchester and Jackson Townships is 169 persons per square mile, whereas the density of Lakehurst Borough is 3,061 persons per square mile.

The areas surrounding NAEC are, in general, not heavily developed. The closest commercial area is located near the southeastern section of the facility in the borough of Lakehurst. This is primarily a residential area with some shops but no industry. To the north and south are State wildlife management areas which are essentially undeveloped. Adjacent to and south of NAEC are commercial cranberry bogs, the drainage from which crosses the southeast section of NAEC property. NAEC is bordered to the west by Fort Dix Military Reservation.

For the combined area of Manchester and Jackson Townships, approximately 41 percent of the land is vacant (undeveloped), 57 percent is residential, one percent is commercial and the remaining one percent is industrial or farmed. For Lakehurst Borough, 83 percent of the land is residential, 11 percent is vacant, and the remaining 6 percent commercially developed.

In the vicinity of the NAEC, water is generally supplied to the populace by municipal supply wells. Some private wells exist, but these are used primarily for irrigation and not as a source of drinking water. In Lakehurst Borough there is a well field consisting of seven 50-foot deep wells, located approximately two-thirds of a mile south of the eastern portion of NAEC. Three of the seven wells (four of the wells are rarely operated) are pumped at an average rate of 70 to 90 gallons per minute and supply drinking water for a population of approximately 3,000. Jackson Township operates one supply well in the Legler area, approximately one-quarter mile north of the NAEC, which supplies water to a very small population (probably less than 1,000) in the immediate vicinity of the NAEC.

Areas A and B are located in the northeastern section of NAEC, as shown on Figure 2. Due to its large size, Area A has been further subdivided into two adjacent sections, Area A-East and Area A-West. Area A-West includes Sites 12, 33 and 42. Area A-East includes Sites 14, 29 and 37 (Figure 3).

The Ridgeway Branch forms the northern boundary of Area A. Route 547 is coincident with the NAEC property boundary and forms the eastern boundary of Area A-East. Along the northern edge of Area A, to the south of and adjacent to the Ridgeway Branch, is a wetland area. The remainder of Area A to the south and west of the wetlands is developed and consists of various facility buildings. The Defense Property Disposal Office (DPDO) storage yard and the Construction Battalion (CB) Compound are located in Area A-East. The eastern half of Area A-West is developed and consists of various facility buildings, including a steam plant and an above-ground tank containment area. The western half of Area A-West is largely undeveloped woodland with ponds in the northern section near the Ridgeway Branch.

Area B is located to the immediate south of Area A and includes Sites 9, 13, 36 and 39. Area B is largely developed and consists primarily of various facility buildings, including Hangars 1, 2 and 3. A large percentage of the Area is paved; no

stream or other surface water bodies are present in Area B. The general direction of groundwater flow in Areas A-West, A-East and B is to the northeast, toward the wetlands and Ridgeway Branch.

SITE HISTORY

The history of the NAEC dates back to 1916, when the Eddystone Chemical Company leased from the Manchester Land Development Company property to develop an experimental firing range for the testing of chemical artillery shells. Testing was accomplished in cooperation and agreement with the Russian Imperial Government until its fall in 1919. At that time, the U.S. Army assumed control of chemical warfare testing by the Eddystone Chemical Company and named the area Camp Kendrick. By the early fall of 1919, construction of Hangar No. 1 for the Navy had commenced. Camp Kendrick was turned over to the Navy and formally commissioned Naval Air Station (NAS), Lakehurst, New Jersey on June 28, 1921. NAEC was moved from the Naval Base, Philadelphia to Lakehurst in December 1974. At that time, NAEC became the host activity, thus, the new name NAEC Lakehurst.

Currently, NAEC's mission is to conduct programs of research, engineering, development testing and evaluation, systems integration, limited production, procurement and fleet engineering support in the following areas: aircraft launching, recovery and landing aid systems; ground support equipment for aircraft and for airborne weapons systems to provide, operate and maintain test sites, facilities, and support services for tests of the above systems and equipment; and conduct research and development of equipment and instrumentation used in tests. NAEC supports Department of Defense (DOD) standardization and specification programs, provides services and material, and operates and maintains aviation and other facilities in support of assigned programs.

NAEC and its tenant activities now occupy more than 300 buildings, built between 1919 and 1979, totaling over 2,845,000 square feet. The command also operates and maintains: two 5,000-foot long runways, a 12,000-foot long catapult and arrest runway, one one-mile long jet car test track, four one and one-quarter mile long jet car test tracks, a parachute jump circle, a 79-acre golf course, and a 3,500-acre conservation area.

The various operations and activities at NAEC required the use, handling, storage, and occasionally resulted in the on-site disposal, of hazardous substances. During the operational period of the facility, there have been documented, reported or suspected releases of these substances into the environment in some areas.

INITIAL INVESTIGATIONS

As part of the DOD Installation Restoration Program, the Navy developed the Navy Assessment and Control of Installation Pollutants (NACIP) program to "identify, assess and control environmental contamination from past methods of storage, handling, and disposal of hazardous substances at naval shore facilities".

As part of the NACIP program, an Initial Assessment Study (IAS) was completed in 1983 by the Naval Energy and Environmental Support Activity (NEESA) at NAEC. The purpose of the IAS was to "identify and assess sites posing a potential threat to human health or the environment due to contamination from past hazardous materials operations".

Based on information from historical records, aerial photographs, field inspections, and personnel interviews, the IAS identified a total of 44 potentially contaminated sites, which were evaluated with regard to contamination characteristics, migration pathways, and pollutant receptors. The IAS concluded that "while none of the sites pose an immediate threat to human health or the environment, 16 warrant

further investigation under the NACIP program, to assess potential impacts". A Remedial Investigation (RI) was recommended "to confirm or deny the existence of the suspected contamination and to quantify the extent of any problems which may exist".

Following further review of available data by Navy personnel, it was decided that 42 of the 44 Sites should be included in the Remedial Investigation. Two potentially contaminated Sites - an ordnance site (Site 41) and an Advanced Underground Storage Facility (Site 43) were deleted from the Remedial Investigation because they had already been remediated.

NAEC was designated in 1987 as a National Priorities List (NPL) site under CERCLA.

ENVIRONMENTAL INVESTIGATION/FEASIBILITY STUDY

Environmental investigations in Areas A and B were initiated in 1981 by NAEC, with the installation of a series of groundwater monitoring wells, which were monitored on a regular basis for the presence of free product. NAEC's Remedial Investigation (RI) was conducted in two phases. Implementation of the verification phase (Phase I of the RI) was initiated in October 1984. Phase II of the RI was initiated in the summer of 1988 to (a) confirm the results of the Phase I study, specifically the presence or absence of contamination; (b) determine the contaminant sources, extent and potential for migration; and (c) support a feasibility study and/or final actions at the Sites.

The Remedial Investigations conducted in Areas A and B are summarized below.

- Phase I Remedial Investigation (1985-1986) - Additional monitoring wells were installed and groundwater samples were collected from approximate-

ly 200 new and existing wells for comprehensive chemical analyses. Analysis of groundwater samples indicated contamination with VOCs. Other media were not investigated. Additional investigations were recommended.

- Phase II Remedial Investigation (1988) - Additional monitoring wells were installed and two rounds of samples were collected from a total of 177 new and existing wells for comprehensive chemical analyses. Approximately 200 samples of soil, sediment and surface water were also collected and analyzed.

- Feasibility Study Field Investigation (1990) - A series of short-term pumping tests were conducted on selected monitoring wells in Areas A and B to obtain preliminary estimates of aquifer characteristics.

- February 1990 - NAEC implemented a program to monitor the amount of floating product in wells ES, EU and EZ, and several piezometers.

- Aquifer Characterization Testing (March 1991) - Five additional wells were installed in the area, four for potential use as groundwater recovery wells and one for potential use as an injection well. Long-term pumping tests were conducted on these wells. The objective of this investigation was to develop data that could be used to design an interim groundwater remedial system capable of capturing and treating contaminated groundwater in Areas A and B.

- Test Pit/Soil Boring Investigation (April 1991) - A series of test pits were excavated and shallow soil borings were hand-augered at Site 33 (Building 345), Site 42, and the adjacent tank containment area. Field screening

methods were used to assess the extent of floating fuel product and soil contamination in this area.

The results of the Phases I and II Remedial Investigations revealed that the primary contaminants present in groundwater were volatile organic compounds (VOCs), including vinyl chloride, alkylbenzenes (benzene, toluene, ethylbenzene and xylene) and several chlorinated hydrocarbons (tetrachloroethylene, trichloroethylene, 1,2-dichloroethylene). VOC contamination occurs in three separate plumes: 1) one large plume encompassing Area B and the eastern portion of Area A-East; 2) a smaller plume in the northern section of Area A-East, to the west of the large plume; and 3) another smaller plume limited to the northern portion of Area A-West (Figure 3). The latter plume consists primarily of tetrachloroethylene.

In addition to volatile organic compounds, a few semi-volatile compounds and metals were detected sporadically in groundwater, but do not appear to be due to any systematic or widespread release.

The exact extent of floating product in Areas A and B has not been precisely determined, but appears to be restricted to the region to the immediate north of the tank containment area at Site 42 and Building 345 at Site 33, in Area A-West (Figure 3).

The Navy determined in the spring of 1990, that it had sufficient data to perform interim remedial action at several sites even though a risk assessment and comprehensive feasibility study was not completed.

In August 1991 the Focused Feasibility Study (FFS) for Areas A and B was distributed to the USEPA, Region II and NJDEPE, Bureau of Federal Case Management for their review. The Proposed Interim Remedial Action Plan (PIRAP) was finalized by NAEC and approved (final concurrence subject to public meeting and

comments) by the above mentioned agencies on August 26, 1991, initiating a 30-day public comment period.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Proposed Interim Remedial Action Plan (PIRAP) for Areas A and B was issued to interested parties on August 26, 1991. A list of the interested parties identified is provided in Appendix A to this Record of Decision. On August 26-28, a newspaper notification inviting public comment on the FFS and PIRAP appeared in the Asbury Park Press, The Ocean County Observer, and The Advanced News. The comment period was held from August 26 to September 26, 1991. The newspaper notification also identified the Ocean County Library as the location of the Information Repository.

A public hearing was held on September 4, 1991. At this meeting, representatives from the Navy, USEPA and NJDEPE were available to answer questions about Areas A and B and the interim remedial alternatives under consideration. A list of attendees is attached as Appendix B.

A response to the comments received during this period is included in the Responsiveness Summary, which is part of this Record of Decision. This decision document presents this selected remedial action for Areas A and B of NAEC in Ocean County, New Jersey, chosen in accordance with CERCLA, as amended by SARA and, to the extent practicable, the NCP. The decision for Areas A and B is based on the administrative record.

SCOPE AND ROLE OF RESPONSE ACTION

The remedial objectives consist of medium-specific or operable unit-specific goals for protecting human health and the environment. The remedial action

objectives of the response action are removing residual amounts of free product, restricting contaminant plume migration, and collecting data on aquifer and contaminant response to the interim remedial response chosen.

The interim remedy is not a final action for groundwater or soil. This action will be the first operable unit (i.e., the first phase of cleanup) of the remediation of Areas A and B at NAEC. The ultimate goal of the final remediation for this area includes decontamination to acceptable levels of all contaminated medium, not just groundwater. One or more future RODs will address this ultimate objective. The interim remedy proposed, however, is consistent with those objectives.

SUMMARY OF AREA CHARACTERISTICS

The VOC groundwater contaminant plume in Areas A-East and B encompasses portions of Sites 9, 13, 14, 29, 36, 37 and 39 (Figure 3). Several reported or potential contaminant sources at these Sites which may be contributing to the plume, are summarized below:

Area	Site	Reported or Potential Contaminant Source(s)	Year of Last Reported or Suspected Release
A-East	14	Releases of mixed liquid wastes from fire fighting pits during fire fighting training activities	1980
A-East	29	Disposal of various liquid and solid wastes in landfill	1960
A-East	37	Surface disposal of aviation gasoline and jet fuel	1967
		Spills and leakages at former drum storage area	pre-1981
B	9	Surface disposal of unknown waste materials	early 1970s
		Surface disposal of unknown liquid wastes from drums	1981

B	13	Leakage or spills associated with former underground fuel tanks at Fuel Farm 125	1984
		2,000-gallon MOGAS spill	1969
B	36	Surface disposal of mixed liquid wastes at perimeter of Hangar 1	1974
		Releases from dry well which received unknown liquids at northeast corner of Hangar 1	1988
B	39	Releases of mixed liquid wastes during steam cleaning of aircraft and other equipment	1960s

The volatile groundwater contaminant plume in Area A-West encompasses portions of Sites 12, 33 and 42 (Figure 2). Reported or potential contaminant sources at these sites are summarized below:

Site	Reported or Potential Contaminant Source(s)	Year of Last Reported or Suspected Release
12	Leakage from two former underground fuel tanks at Pad 141	1980
	Spills related to filling of fuel tanks at Pad 141	1980
	Releases from Building 266 (a former dry cleaning facility)	pre-1981
33	Discharges from dry well which received mixed liquid wastes	mid-1980s
42	Surface disposal of mixed wastes in landfill	mid-1940s
	Two underground fuel oil tanks at Power Plant 1 (Building 15)	no reported releases

As indicated above, the primary sources of contamination are past releases of fuel from underground tanks, leaky valves and pipes, unidentified spills, as well as generally poor "housekeeping" practices. The underground tanks have been removed.

Actions have been taken by NAEC to minimize or eliminate leakage from valves and pipes to improve employee waste management practices.

Areas A and B are located in the northeastern corner of NAEC (Figure 2). The depth to the water table in this area decreases from about 35 feet in Area B to 4 feet along the northern boundary of Area A. Groundwater flow in this area is in a generally northeastern direction toward the wetlands and Ridgeway Branch. Two base potable water supply wells (PW-5 and PW-9) are located in Area A-West (Figure 3).

During the Phase II Investigation, two rounds of groundwater samples were collected from all monitoring and supply wells in Areas A and B. Soil, sediment and surface water samples were also collected for comprehensive chemical analysis. The analytical results for this and previous sampling are provided in Tables 1 through 10.

SUMMARY OF SITE RISKS

A baseline risk assessment was not conducted for Areas A and B for the interim remedial action. However, because Federal Maximum Contaminant Levels (MCLs), which are generally risk-based numbers, have been exceeded for several contaminants, remedial action is necessary. A comprehensive feasibility study and risk assessment will be prepared prior to the initialization of the final remedial action at the site. The risk assessment will consist of hazard identification, a dose-response evaluation, exposure assessment and risk characterization. This interim action is being implemented to stop the migration of the contaminant plume and residual floating product (environmental risk) from Areas A and B toward the wetlands and Ridgeway Branch which feeds Pine Lake, a major recreational body of water in the county. This action will limit exposure risks to natural fauna along the Ridgeway Branch and the population using Pine Lake for recreational activities.

Tables 1 through 10 provide a summary of the contaminants detected, and their concentration ranges, in Areas A and B. The estimated extent of the VOC plumes in Areas A and B is shown in Figure 3.

DESCRIPTION OF ALTERNATIVES

Two remedial alternatives (and the "no action alternative") were developed for analysis in the FFS for Areas A and B. Each of these alternatives is described in detail below:

ALTERNATIVE 1: No Interim Action

Estimated Construction Cost:	$100,000 (for monitoring well network)
Estimated Net O&M Cost:	$200,000/yr
Estimated Implementation Time Frame:	N/A

This alternative involves no interim action at Areas A and B prior to final actions other than groundwater monitoring of the aquifer. No contaminants would be treated or contained and the existing health and environmental risks would remain.

Under this alternative, no further action to control groundwater contamination would be taken until 1993, when a final action for this site is proposed and developed. Long-term monitoring of the site can be implemented with existing monitoring wells, supplemented by the additional wells necessary to create an effective monitoring well network.

ALTERNATIVE 2: **Groundwater Pumping, Removal of Free Product, Treatment, Recharge and In-Situ Soil Flushing**

Estimated Construction Cost:	$3,500,000
Estimated Net O&M Cost:	$400,000/yr
Estimated Implementation Time Frame:	12 months
Time frame for operation of system:	3 year (after which a final action will be initiated for groundwater remediation)

This alternative would consist of a groundwater remediation and free product recovery system. The groundwater remediation system would consist of groundwater pumping, treatment and discharge to the aquifer. A total of six recovery wells would be pumped at an estimated combined rate of 585 gallons per minute (gpm). The contaminated groundwater would be pumped into a tank which will serve as a flow equalizer. The effluent would be treated at the site and discharged back into the aquifer through a combination of one or more of the following systems: infiltration trenches, infiltration fields and spray irrigation fields. Additional wells will be installed to monitor the effectiveness of this interim action.

To treat VOCs and other contaminants present in the extracted groundwater, the treatment system to be constructed at Areas A and B would consist of: 1) a pretreatment unit for metals, residual free product and solids removal; 2) two air stripping columns (99% VOC removal); 3) a granular activated carbon air filter for air stripper emissions; and 4) a granular activated carbon polishing filter for residual VOC and semi-volatile removal (99.9% removal of VOCs) from treated groundwater. The proposed system is shown schematically in Figure 4. The free product removed will be disposed of at an approved off-site facility. NAEC is not equipped to recycle waste fuels or oils.

The effluent exiting the air stripper will be treated by a granular activated carbon air filter and the treated air will be discharged to the atmosphere. The effluent will attain applicable NJDEPE air standards. The treated groundwater, which will be discharged to the aquifer, will meet the NJDEPE Groundwater Discharge Effluent Limitations and Safe Drinking Water Act water quality standards. This alternative will halt the migration of the contaminant plume, enhance groundwater quality, flush additional contaminants out of the soil at certain locations, and recover free product.

The discharge effluent limitations for the Interim Remedial action will be established in accordance with the New Jersey Pollutant Discharge Elimination System (NJPDES) Regulations (NJAC 7:14A-1 et. seq.) and the New Jersey Groundwater Quality Standards (NJAC 7:9-6 et. seq.). The discharge effluent limitations (Maximum Contaminant Levels (MCLs) and Safe Drinking Water Act criteria) will be issued to NAEC in the form of a NJPDES Discharge to Groundwater (DGW) Permit Equivalence.

ALTERNATIVE 3: Groundwater Pumping, Removal of Free Product, Treatment and Discharge to Surface Water

Estimated Construction Cost:	$3,000,000
Estimated Net O&M Cost:	$300,000/yr
Estimated Implementation Time Frame:	9 months
Time frame for system operation	3 years (after which a final action will be initiated for groundwater remediation)

This alternative would be similar to Alternative 2, with the exception that treated groundwater would be discharged via piping to the Ridgeway Branch instead

of being recharged back into the aquifer. As with Alternative 2, free product would be disposed of at an approved off-site facility.

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The three alternatives identified above were evaluated using criteria derived from the NCP and the SARA of 1986. These criteria relate to the SARA amendment of Section 121 of CERCLA (Section 121(b)(1)) and Section 300.430(e)(9) of the NCP and are as follows:

- Overall Protection of Human Health and the Environment draws on the assessments conducted under other evaluation criteria and considers how the alternative addresses site risks through treatment, engineering or institutional controls.

- Compliance with ARARs evaluates the ability of an alternative to meet ARARs established through Federal and State statutes and/or provides the basis for invoking a waiver.

- Long-Term Effectiveness and Permanence evaluates the ability of an alternative to provide long-term protection of human health and the environment and the magnitude of residual risk posed by untreated wastes or treatment residuals.

- Reduction of Toxicity Mobility or Volume through Treatment evaluates an alternative's ability to reduce risks through treatment technology.

- Short-Term Effectiveness evaluates the cleanup time frame and any adverse impacts posed by the alternative during the construction and implementation phase, until cleanup goals are achieved.

- Implementability is an evaluation of the technical feasibility, administrative feasibility and availability of services and material required to implement the alternatives.

- Cost includes an evaluation of capital costs, annual operation and maintenance costs, and net present worth costs.

- State Acceptance indicates the State's response to the alternatives in terms of technical and administrative issues and concerns.

- Community Acceptance evaluates the issues and concerns the public may have regarding the alternatives.

A comparative discussion of the three alternatives on the basis of the evaluation criteria presented above follows.

- Overall Protection of Human Health and the Environment - Alternative 2 provides the greatest overall protection of human health and the environment through treatment of groundwater and, to some degree, soils. Alternative 3 is similar to Alternative 2, except treated groundwater is discharged to surface water as opposed to the aquifer. By implementing Alternative 3, in which water is extracted from the aquifer and discharged to surface water, the current over pumpage of the coastal aquifer is exacerbated. Alternative 2 is a closed loop system in which the aquifer is recharged by the treated groundwater. Alternative 1, which offers no soil or groundwater treatment, is the least protective alternative.

- Long-Term Effectiveness and Permanence - Alternatives 2 and 3 are interim actions and are intended to be short-term responses. therefore, the long-term effectiveness cannot be addressed. However, if the interim

remedial alternative chosen proves to be effective, it will be incorporated into and/or modified to become the final remedial action. Alternative 1 provides no treatment and is not considered to be effective.

- Reduction of Toxicity, Mobility or Volume - In Alternatives 2 and 3, the vapor and aqueous phase carbon systems will capture through adsorption volatile and semi-volatile compounds. Hence, the toxicity and contaminant load (volume) of the groundwater will be reduced by the removal of these compounds. The simultaneous pumping of six recovery wells will alter groundwater flow patterns such that the (normal) downgradient migration of groundwater, and hence, groundwater contaminants, will be impeded, thereby reducing their mobility in the normally downgradient (off-site) direction. Destruction of contaminants will occur during the regeneration of carbon at an off-site facility. Alternative 1 offers no treatment of the contaminated media.

- Short-Term Effectiveness - In the short-term, interim remedial action Alternatives 2 and 3 will impede the further downgradient migration of contaminated groundwater and residual amounts of floating product. They will also prevent the contaminant plume and residual floating product from potentially entering the wetlands. Alternative 2 has the added benefit of flushing the soil of some contaminants (in areas where treated water is being recharged) and increasing the hydraulic gradient, thus accelerating the remediation process. In Alternative 3, treated groundwater is discharged to the Ridgeway Branch and hence, no soil flushing takes place. Alternative 1 provides no treatment of soil or groundwater and is not considered to be effective in the short-term because residual risks are not reduced.

- Implementability - Alternative 1 offers the greatest implementability, followed by Alternatives 2 and 3, which involve conventional technologies with proven reliability.

- Cost - Alternative 1, the no action alternative, has the lowest associated cost. Alternative 2 has a capital cost of about $3,500,000 and O&M costs of about $400,000 per year. Alternative 3 has a capital cost of about $3,000,000 and O&M costs of about $300,000 per year. The costs for Alternative 2 are higher than those for Alternative 3 because they include the construction and maintenance of a complex infiltration system.

- Compliance with ARARs - Alternative 1 does not have to comply with action-specific and location-specific ARARs because no interim remedial action will be implemented to reduce contaminant levels. Alternatives 2 and 3 will both comply with action-specific ARARs such as OSHA, RCRA and the Endangered Species, Clean Air and Clean Water Acts. State and Federal action-specific ARARs pertaining to discharge of treated water to the ground surfaces, groundwater and surface waters is also addressed and will be complied with during the interim remedial action.

  According to available information (wetland and floodplain delineations by the U.S. Fish and Wildlife Service and the U.S. Army Corps of Engineers, respectively), there are wetlands located north of, and downgradient of Areas A and B. Ongoing investigations are being conducted to assess the impact of the proposed remedial system on the wetlands. During the implementation of the proposed interim remedial action, the Navy will work closely with the U.S. Fish and Wildlife Service to prevent any adverse impacts on the wetlands resulting from the proposed action. The proposed action is not expected to impact any historic cultural resources.

Because of the limited focus of this proposed interim action, contaminant-specific cleanup levels for groundwater have not been identified for Alternatives 2 and 3. These levels will be identified and met when a final remedial action is chosen for Areas A and B. Treatment residuals will be tested to determine whether RCRA Land Disposal Restrictions apply for Alternatives 2 and 3. Location-specific ARARs, which will include aquifer and facility groundwater remediation issues, will be addressed in the final remedy. The New Jersey Pollutant Discharge Elimination System (NJPDES) Discharge to Groundwater (DGW) permit equivalence will be applied for to irrigate and infiltrate the treated groundwater. The treated water will meet the NJDEPE Groundwater Discharge Effluent Limitations as set forth in the permit equivalence.

- Federal and State Regulatory Agency Acceptance - The preferred alternative (Alternative 2) is acceptable to the EPA and NJDEPE.

- Community Acceptance - Community acceptance of the preferred alternative has been evaluated on the basis of public comments and is described in the Responsive Summary of this Record of Decision.

SELECTED INTERIM REMEDY

The following section describes in detail the interim remedial action plan which the Navy Air Engineering Center, in concurrence with the USEPA and NJDEPE, has selected to implement at Areas A and B. This selection is identical to that presented in the Proposed Interim Remedial Action Plan. Because this is an interim action, changes could be implemented during the final design and construction processes. Such changes reflect modifications resulting from the engineering design process and will not substantially change the intent of the selected alternative described herein.

The selected interim remedial action is Alternative 2 - Groundwater Pumping, Removal of Free Product, Treatment, Recharge and In Situ Soil Flushing. This alternative will address groundwater treatment and product extraction simultaneously. The Alternative is cost-effective and implements proven technologies.

Groundwater and residual amounts of free product will be extracted via six wells at an estimated total pumping rate of 585 gpm (see Figure 5). The extracted water will be held in a flow equalization tank and then pretreated to remove metals, free product and solids. The extracted free product will be sent to a permitted off-site disposal facility. NAEC will comply with New Jersey Hazardous Waste Regulations. The pretreated water will be air-stripped and polished to remove VOCs (99.9%) and SVOCs. Due to the transfer of contaminants from the aqueous phase to the airstream, emissions control units will be required on the air strippers. The treatment system, including the emission control unit, will be designed to meet the substantive requirements of the New Jersey air pollution control regulations (N.J.A.C. 7:27-16). The effluent from the air stripper will be treated by a granulated activated carbon air filter, prior to discharge to the atmosphere. Residual sludge from the pretreatment process will be tested to determine if the waste is hazardous and if RCRA land disposal restrictions are applicable. The waste will be handled accordingly. Spent granular activated carbon will be sent to the vendor for regeneration.

Once treated, the groundwater which will meet Federal and State Drinking Water Standards (N.J.A.C. 7:14A-1.1 et seq.), including MCLs and Safe Drinking Water Act Criteria which are the discharge effluent criteria for this limited action. Recharge to the aquifer will occur through an irrigation and infiltration system as shown on Figures 3 and 5. The treated water will be spray-irrigated over areas of subsurface soil contamination. This action will increase biological activity, promoting contaminant decomposition.

The groundwater classification for the immediate NAEC area is Central Pine Barrens GWI. The groundwater is suitable for potable water supply, agricultural water supply, continual replenishment of surface waters to maintain the existing quantity and high quality of the surface waters of the Central Pine Barrens, and other reasonable uses. Quality criteria for these waters may be found in N.J.A.C. 7:9-6.5.

During implementation of this interim action, neighboring wetland areas will be carefully monitored to assess the affect of the groundwater remediation effort, and prevent significant adverse impacts, on the the wetlands.

The remedial action in the short term will halt the spread of contaminated groundwater and residual amounts of floating product from entering ecologically sensitive areas.

This interim remedial action will be implemented for three years (two years to facilitate data collection, which will provide hydrogeological information necessary for final remedial action, and one year to prepare a final ROD and contract, design and implement the final remedy). This action is effective in the short term in preventing further degradation of the aquifer. If the interim remedy proves to be effective, it will be incorporated and/or modified to become the final remedial action.

STATUTORY DETERMINATIONS

Under Section 121 of CERCLA and Section 300.430(f)(5) of the NCP, selected remedies must meet certain statutory and regulatory requirements. These requirements and a description of how the selected remedy satisfies each requirement are presented below.

Protection of Human Health and the Environment

The selected alternative will protect human health and the environment through treatment of the contaminated groundwater and in situ soil flushing. The treated groundwater will meet or exceed Safe Drinking Water Standards. Residual amounts of floating free product will be extracted and removed to a permitted off-site disposal facility.

The interim remedial action will impede the migration of the contaminant plume and residual amounts of floating product into the Ridgeway Branch, which feeds Pine Lake, a major recreational body of water in the county. This interim action will, in the short term, prevent further degradation of the aquifer and limit potential contaminant exposure risks to the population using Pine Lake.

Compliance with ARARs

The selected remedy will comply with action-specific ARARs such as OSHA, RCRA and the Clean Air and Water Acts. State and Federal action-specific ARARs pertaining to the discharge of treated water to the ground surface and groundwater is also addressed and will be complied with during the interim action. Also, treated water will meet Safe Drinking Water Standards prior to spray-irrigation and infiltration. A list of ARARs specific to this action is presented in Table 11.

Cost-Effectiveness

The selected remedy provides groundwater treatment and removal of residual amounts of floating product through treatment methods that have been proven effective, cost-efficient and expected to attain ARARs.

Preference for Treatment as a Principal Element

The principal threats at Areas A and B include groundwater and soil contamination and, locally, the presence of residual amounts of floating fuel product. The selected remedy satisfies the statutory preference for treatment as a principal element in addressing the human health and environmental threats posed by the site. Groundwater will be treated by air-stripping to remove VOCs and polished by granular activated carbon to remove SVOCs and further reduce VOC levels. In situ soil flushing will aerate and enhance biological activity and contaminant decomposition. Residual amounts of floating product will be collected and disposed at an off-site permitted hazardous waste facility.

The interim remedy is not a final action for groundwater or soil. The ultimate goal of the final remediation of this are should include decontamination to acceptable levels of any contaminated medium, not just groundwater. The selected interim remedy, however, should be consistent with those objectives.

Document of Significant Changes

The Proposed Interim Remedial Action Plan (PIRAP) for Areas A and B was released for public comment on August 26, 1991. The PIRAP identified Alternative 2 as the preferred alternative. NAEC received one written comment on the Plan, from the New Jersey Pinelands Commission. All verbal comments were responded to at the public hearing on September 4, 1991. Upon review of the comments, it was determined that no significant changes to the interim remedy, as it was originally identified in the PIRAP, were necessary.

RESPONSIVENESS SUMMARY
AREAS A AND B
NAVAL AIR ENGINEERING CENTER

The purpose of this responsiveness summary is to review public response to the Proposed Interim Remedial Action Plan (PIRAP) for Areas A and B. It also documents NAEC's consideration of such comments during the decision-making process and provided answers to any major comments raised during the public comment period.

The responsiveness summary for Areas A and B is divided into the following sections:

- Overview - This section briefly describes the FFS process used to develop and evaluate interim remedial responses for Areas A and B, the interim remedial alternative recommended within the PIRAP and any impacts on the proposed plan due to public comment.

- Background on Community Involvement - This section describes community relations activities conducted with respect to the area of concern.

- Summary of Major Questions and Comments - This section summarizes verbal and written comments received during the public meeting and public comment period.

- Remedial Design/Remedial Action Concerns - This section describes public concerns which are directly related to design and implementation of the selected remedial alternative.

OVERVIEW

Areas A and B are located at NAEC in Ocean County, Lakehurst, New Jersey, and are under investigation for potential environmental contamination. This responsive summary addresses remediation and public response to the PIRAP for Areas A and B.

A summary of the site background, the alternatives evaluated and a comparison of alternatives are presented in the PIRAP for Areas A and B and are more fully described in the FFS report. Both documents, as well as other supporting information, are available for public review at the information repository located at the Ocean County Library, 101 Washington Street, Toms River, New Jersey.

BACKGROUND ON COMMUNITY INVOLVEMENT

This section provides a brief history of community participation in the investigation and interim remedial planning activities conducted at Areas A and B. Throughout the investigation and FFS period, the USEPA and NJDEPE have been directly involved through proposal and project review and comments. Periodic meetings have been held to maintain open lines of communication and to keep all parties abreast of current activities.

Prior to the public release of site-specific Area A and B documents, NAEC's public relations staff compiled a list of local public officials who demonstrated or were expected to have an interest in the investigation. Local environmental interest groups were also identified and included on this list. The list is provided as Appendix A to this Record of Decision.

On August 26, 1991, NAEC mailed the PIRAP for Areas A and B to concerned parties on the list described above. On August 26 through 28, a public

notice appeared in The Asbury Park Press, The Ocean County Observer and The Advance News. The public notice summarized the feasibility study process, the remedial alternatives considered and the preferred remedial alternative. The announcement also identified the time and location of a public comment period, and the address to which the written comments could be sent. Public comments were accepted from August 26 through September 26, 1991.

A public meeting was held on September 4, 1991, at 7:30 p.m. at the Lakehurst Elementary School in Lakehurst, New Jersey. Discussed at this meeting were the Areas A and B investigations, feasibility study process and the proposed interim remedial alternative, as well as the Proposed Remedial Action Plan (PRAP), proposing the "no-action" alternative, for NAEC Sites 5, 19 and 21. NAEC representatives present included: Carol Ancellin, Deputy Public Affairs Officer; Robert Kirkbright, engineering director; Lucy Bottomley, head environmental engineer; Aarti Dalal Reddy, Michael Figura, and Jill Meredith; environmental engineers. Jeffrey Gratz, represented the USEPA's Federal Facility Section; Ms. Donna Gaffigan represented the NJDEPE's Bureau of Federal Case Management; Mr. Kevin Schick represented NJDEPE's Bureau of Environmental Evaluation and Risk Assessment; and Ms. Linda Welkom represented NJDEPE's Bureau of Groundwater Pollution Abatement. The attendance list for the Public Hearing is provided in Appendix B.

SUMMARY OF MAJOR QUESTIONS AND COMMENTS

Written Comments

During, and subsequent to, the public comment period from August 26 through September 26, 1991, the only written comments received on the Proposed Plan were those of the New Jersey Pinelands Commission, presented in a letter to NAEC dated October 8, 1991. The comments presented in that letter and the NAEC responses are provided below:

Comment No. 1

The Pinelands Protection Act (N.J.S.A. 18A-1 et seq.) and the Pinelands Comprehensive Management Plan (N.J.A.C. 7:50-1.1 et seq.) are applicable or relevant and appropriate requirements (ARARs) as defined by CERCLA. Of particular concern are the water quality and wetland protection requirements of the Comprehensive Management Plan.

Comment No. 2

The final remediation must propose to treat the contaminated groundwater to meet the non-degradation standard contained in N.J.A.C. 7:50-6.83(b).

Response

For this action, treated groundwater will meet Federal and State Drinking Water Standards which include Maximum Contaminant Levels and Safe Drinking Water Act Criteria. Treated groundwater will be discharged back into the contaminated aquifer as part of a closed loop system.

Because this is an interim action, final groundwater cleanup levels are not currently addressed. As part of the final remedial action, New Jersey Groundwater Quality Criteria and Maximum Contaminant Levels established pursuant to the Federal and State Safe Drinking Water Acts will be applicable or relevant and appropriate Federal and State groundwater requirements (ARARs). Because the area

being remediated exists in the Central Pine Barrens area (GW-1 waters), the Navy recognizes the N.J.A.C. goal for groundwater quality in this area as natural background. The final action will be consistent with the above ARARs and N.J.A.C. goal.

Comment No. 3

The Comprehensive Management Plan precludes most development in fresh water wetlands (N.J.A.C. 7:50-6.6). It also requires a buffer of 300 feet to wetlands unless it is demonstrated that a lesser buffer will not result in a significant adverse impact on the wetland (N.J.A.C. 7:50-6.7 and 6.14). A delineation of the wetlands within 300 feet of these sites must be performed prior to the implementation of this proposed action to determine the need of an equivalent to a Waiver of Strict Compliance from the wetlands protection requirements of the Plan.

Response

Discussions leading to a resolution of the issues raised in this comment (including the need for a permit equivalency and Waiver of Strict Compliance) are currently in progress between NAEC and the Pinelands Commission.

Comment No. 4

Prior to the construction and implementation of the interim remedial measure, an application must be filed with the

Commission for a "permit equivalency" from the Pinelands Commission which is required prior to any other local or state agency taking action on the proposed development.

Response

Discussions leading to the resolution of this issue are currently underway between NAEC and the Pinelands Commission.

Public Meeting Comments

The complete transcript of the questions asked and the answers given during the September 4, 1991 public hearing is provided in Appendix C to this Record of Decision. This public hearing addressed both the interim remedial action in Areas A and B and the proposed "no-action" alternative for Sites 5, 19 and 21.

TABLE 1

HISTORICAL SUMMARY OF ANALYTICAL DATA - SITE 9, AREA B

Pre-1985	Phase I Remedial Investigation (1985-86)	Phase II Remedial Investigation (1988)
No data available	Groundwater	Groundwater
	Volatile Organic Compounds (µg/l)	Volatile Organic Compounds (µg/l)
	1,1,1-Trichloroethane: 50.0 Carbon Tetrachloride: 6.66	1,1,1-Trichloroethane: ND - 23
		Metals (µg/l)
		Chromium: ND - 58.3* Lead: ND - 53.8*
		*ND in filtered sample
	Soil	Soil
	No data collected	Semi-Volatile Organic Compounds (µg/kg)
		Fluoranthene: ND - 70 Pyrene: ND - 50 Chrysene: ND - 90
		Miscellaneous (µg/g)
		Petroleum Hydrocarbons: ND - 1,437.27

NOTE:

ND = Not Detected

TABLE 2

HISTORICAL SUMMARY OF ANALYTICAL DATA - SITE 13, AREA B

1984	Phase I Remedial Investigation (1985-86)	Phase II Remedial Investigation (1988)
Groundwater	Groundwater	Groundwater
Volatile Organic Compounds (µg/l)	Volatile Organic Compounds (µg/l)	Volatile Organic Compounds (µg/l)
Benzene: 360 Toluene: 37.5 Tetrachloroethylene: 17.2	Benzene: ND - 217 Ethylbenzene: ND - 95.7 1,2-trans-dichloroethylene: ND - 7.36 1,1-Dichloroethylene: 3.30 - 4.58 1,1,1-Trichloroethane: 13.8 - 36.2 Trichloroethylene: 110 - 253	Benzene: ND - 380 Toluene: ND - 2,000 Ethylbenzene: ND - 190 Xylenes: ND - 580 1,1-Dichloroethene: ND - 9 1,1,1-Trichloroethane: ND - 23 Trichloroethene: ND - 69
		Semi-Volatile Organic Compounds (µg/l)
		2-Methylnaphthalene: ND - 24 Naphthalene: ND - 60 Phenol: ND - 3 bis(2-chloroisopropyl)ether: ND - 7 4-methylphenol: ND - 4 n-nitrosodi-n-propylamine: ND - 6
		Metals (µg/l)
		Cadmium: ND - 18.9 Chromium: ND - 80.6 Lead: ND - 200
Soil	Soil	Soil
	No data collected	Volatile Organic Compounds (µg/kg)
		2-Hexane: ND - 25,000 Toluene: ND - 23,000 Ethylbenzene: ND - 11,000 Xylenes: ND - 87,000
		Semi-Volatile Organic Compounds (µg/kg)
		2-Methylnaphthalene: ND - 1,100 Naphthalene: ND - 14,000 Fluorene: ND - 250 Phenanthrene: ND - 170
		Miscellaneous
		Petroleum Hydrocarbons: ND - 1,305.24 µg/g

TABLE 3

HISTORICAL SUMMARY OF
ANALYTICAL DATA - SITE 14, AREA A-EAST

Pre-1985	Phase I Remedial Investigation (1985-86)	Phase II Remedial Investigation (1988)
		Soil Gas and Groundwater Screening Surveys Total chlorinated hydrocarbons in soil gas: ND - 48,000 µg/l Total petroleum hydrocarbons in soil gas: ND - 10,000 µg/l Total chlorinated hydrocarbons in groundwater: ND - 0.93 µg/l Total petroleum hydrocarbons in groundwater: ND - 23 µg/l
Groundwater In conjunction with a study of Site 29 - Original Base Landfill, five monitoring wells were installed in the area surrounding Site 14. In 1983, downgradient monitoring well AD contained: Benzene: 45 µg/l 1,2-dichloroethene: 100 µg/l 1,2-transdichloroethylene: 165 µg/l	Groundwater Volatile Organic Compounds (µg/l) 1,2-trans-dichloroethylene: 51.6 - 59.2 Vinyl chloride: 40.2 - 51.1 Semi-Volatile Organic compounds (µg/l) 2,4-Dimethylphenol: ND - 77 Miscellaneous Petroleum hydrocarbons (mg/l): 1.1 - 3.4	Groundwater Volatile Organic Compounds (µg/l) Benzene: ND - 130 1,2-Dichloroethene: ND - 2,400 Vinyl chloride: ND - 2,000 Toluene: ND - 91 Ethylbenzene: ND - 9 Xylenes: ND - 73 Chloromethane: ND - 2 Semi-Volatile Organic compounds (µg/l) 2-Methylnaphthalene: ND - 23 Phenol: ND - 2 2,4-Dichlorophenol: ND - 29 2,4-Dimethyl phenol: ND - 2 Metals (µg/l) Lead: ND - 86 Miscellaneous Petroleum hydrocarbons (mg/l): ND - 32

NOTE:

ND = Not Detected

TABLE 3 (continued)

Soil	Soil
Petroleum Hydrocarbons (mg/kg): 84	Volatile Organic Compounds (ug/kg) Chloroform: ND - 4 Ethylbenzene: ND - 7 Xylenes: ND - 53
	Semi-Volatile Organic Compounds (ug/kg) Eight semi-volatile compounds detected. Highest concentrations at Site 14 were detected in sample S14-6, consisting of 2-Methylnaphthalene: 10,000 Pesticides/PCBs (ug/kg) Delta-BHC: ND - 45 4,4'-DDD: ND - 230.6 4,4'-DDT: ND - 140.1 Metals (mg/kg) Lead: ND - 254 Miscellaneous Petroleum Hydrocarbons (ug/g): 1,069.46 - 70,569.27
Surface Water (Groundwater Seep)	Surface Water (Groundwater Seep)
No data collected	Semi-Volatile Organic Compounds (ug/l) Benzyl Alcohol: ND - 6 4-Methylphenol: ND - 2 Benzoic Acid: ND - 2 Trichloroethene: ND - 12 Pesticides/PCBs (ug/l) Delta-BHC: 0.16 - 0.22 4,4'-DDD: 0.05 - 0.17 Metals (ug/l) Lead: ND - 82 Miscellaneous Parameters Petroleum Hydrocarbons: 6.0 mg/l Miscellaneous Parameters Petroleum Hydrocarbons: ND - 22.3 mg/l
	Sediment (Groundwater Seep) Semi-Volatile Organic Compounds (ug/kg) 13 semi-volatile organic compounds detected, primarily polycyclic aromatic hydrocarbons (PAHs) Pesticides/PCBs (ug/kg) 4,4'-DDE: ND - 270 Miscellaneous Parameters (ug/g) Petroleum Hydrocarbons: ND - 6,736.8

NOTE:

ND = Not Detected

TABLE 4

HISTORICAL SUMMARY OF ANALYTICAL DATA - SITE 29, AREA A-EAST

Pre-1985

Groundwater

Volatile Organic Compounds (µg/l)

Benzene: ND - 360
Toluene: ND - 37.5
Ethylbenzene: ND - 2.4
Carbon Tetrachloride: ND - 12.1
1,2-Dichloroethane: ND - 3.0
1,1-Dichloroethane: ND - 17.2
1,2-trans-Dichloroethylene: ND-165

Phase I Remedial Investigation (1985-86)

Groundwater

Volatile Organic Compounds (µg/l)

1,2-Transdichloroethylene: ND - 59.2
Vinyl chloride: ND - 51.1

Semi-Volatile Organic Compounds (µg/l)

2,4-Dimethylphenol: ND - 77

Miscellaneous

Petroleum Hydrocarbons (mg/l): ND - 5.4
Total Organic Halogens (µg/l): 28.3

Phase II Remedial Investigation (1988)

Soil Gas and Groundwater Screening Surveys

Total chlorinated hydrocarbons in soil gas: ND - 48,000 µg/l

Total petroleum hydrocarbons in soil gas: ND - 10,000 µg/l

Total chlorinated hydrocarbons in groundwater: ND - 26.61 µg/l

Total petroleum hydrocarbons in groundwater: ND - 300 µg/l

Groundwater

Volatile Organic compounds (µg/l)

Vinyl chloride: ND - 1,500
Chloromethane: ND - 2
Xylenes: ND - 73
1,2-Dichloroethene: ND - 2,400
Dibromochloromethane: ND - 8
Benzene: ND - 230
Toluene: ND - 91
Ethylbenzene: ND - 9

Semi-Volatile Organic Compounds (µg/l)

2,4-Dichlorophenol: ND - 29
2,4-Dimethylphenol: ND - 2
4-Methylphenol: ND - 2
Phenol: ND - 2
Naphthalene: ND - 8
2-Methylnaphthalene: ND - 19

Metals (µg/l)

Cadmium: ND - 276
Chromium: ND - 144
Lead: ND - 843
Cyanide: ND - 271

Miscellaneous

Petroleum Hydrocarbons (mg/l): ND - 32

TABLE 4 (continued)

Soil	Soil
	Volatile Organic Compounds (µg/kg)
	Chloroform: ND - 4 Ethylbenzene: ND - 7 Xylenes: ND - 53
	Semi-Volatile Organic Compounds (µg/kg)
	4-Methylphenol: ND - 150 Di-n-butyl phthalate: ND - 60 Fluoranthene: ND - 230 Pyrene: ND - 240 Chrysene: ND - 130 Benzo(a)fluoranthene: ND - 110 Benzo(k)fluoranthene: ND - 100 Benzo(a)pyrene: ND - 100 2-Methylnaphthalene: ND - 10,000 Phenanthrene: ND - 90 Indeno(1,2,3-c,d) pyrene: ND - 60 Benzo(ghi)perylene: ND - 60
	Pesticides/PCBs (µg/kg)
	4,4'-DDT: ND - 140.1 4,4'-DDD: ND - 230.6 Delta-BHC: ND - 45 4,4'-DDE: ND - 270
	Metals (mg/kg)
	Cadmium: ND - 4.7 Lead: ND - 254
Miscellaneous (mg/kg)	Miscellaneous (µg/g)
Petroleum Hydrocarbons: 84	Petroleum Hydrocarbons: ND - 70,569.27
Surface Water	Surface Water
	Volatile Organic Compounds (µg/l)
	1,2-Dichloroethene: ND - 2 Trichloroethene: ND - 12
	Semi-Volatile Organic compounds (µg/l)
	Benzyl Alcohol: ND - 6 4-Methylphenol: ND - 2 Benzoic Acid: ND - 2
	Pesticides/PCBs (µg/l)
	Delta-BHC: ND - 0.22 4,4'-DDD: ND - 0.17
	Metals (µg/l)
	Lead: ND - 82
Miscellaneous	Miscellaneous
Petroleum Hydrocarbons (mg/l): ND - 6 Total Organic Halogens (µg/l): 25.9 - 52.6	Petroleum Hydrocarbons (mg/l): ND - 22.3

TABLE 4 (continued)

Sediment	Sediment
No data collected	Semi-Volatile Organic Compounds (µg/kg) Acenaphthylene: ND - 70 Acenaphthene: ND - 60 Fluorene: ND - 90 Phenanthrene: ND - 290 Anthracene: ND - 60 Fluoranthene: ND - 670 Pyrene: ND - 660 Benzo(a)anthracene: ND - 220 Chrysene: ND - 300 Benzo(b)fluoranthene: ND - 490 Benzo(k)fluroanthene: ND - 410 Benzo(a)pyrene: ND - 310 Pesticides/PCBs (µg/kg) 4,4'-DDE: ND - 270 Miscellaneous Petroleum Hydrocarbons: ND - 6,736.8

NOTE:

ND = Not Detected

TABLE 5

HISTORICAL SUMMARY OF
ANALYTICAL DATA - SITE 36, AREA B

Pre-1985	Phase I Remedial Investigation (1985-86)	Phase II Remedial Investigation (1988)
No data collected	Groundwater	Groundwater
	Volatile Organic Compounds (µg/l)	Volatile Organic Compounds (µg/l)
	Trichloroethene: 8.99	1,1-Dichloroethene: ND - 7 1,2-Dichloroethene: ND - 20 1,1,1-Trichloroethane: ND - 11 Trichloroethene: ND - 76
		Metals (µg/l)
		Chromium: ND - 92.1
	Soil	Soil
	No data collected	Semi-Volatile Organic Compounds (µg/kg)
		Phenanthrene: ND - 140 Fluoranthene: ND - 310 Pyrene: ND - 230 Benzo(a)anthracene: ND - 120 Chrysene: ND - 150 Benzo(b)fluoranthene: ND - 140 Benzo(k)fluoranthene: ND - 170 Benzo(a)pyrene: ND - 130
		Pesticides/PCBs (µg/kg)
		Arochlor 1254: ND - 360
		Miscellaneous
		Petroleum Hydrocarbons: ND - 2,150 µg/g
		Dry Well Sediment
		Semi-Volatile Organic Compounds (µg/kg)
		Phenanthrene: 75 Fluoranthene: 708 Pyrene: 677 Benzo(a)anthracene 489 Chrysene: 521 Benzo(b)fluoranthene: 396 Benzo(a)pyrene: 427 Indeno (1,2,3-c,d)pyrene: 229 Benzo(yhi)perylene: 250
		Metals (mg/kg)
		Chromium: ND - 275 Nickel: ND - 119

NOTE:

ND = Not Detected

TABLE 6

HISTORICAL SUMMARY OF ANALYTICAL DATA - SITE 37, AREA A-EAST

Pre-1985	Phase I Remedial Investigation (1985-86)	Phase II Remedial Investigation (1988)
		Soil Gas and Groundwater Screening Surveys Total chlorinated hydrocarbons in soil gas: ND - 0.61 µg/l Total petroleum hydrocarbons in soil gas: ND - 0.06 µg/l) Total chlorinated hydrocarbons in groundwater: ND - 3.07 µg/l Total petroleum hydrocarbons in groundwater: ND - 16 µg/l
Groundwater Monitoring well AC was installed as part of a groundwater investigation to address Site 29. No contaminants were detected in groundwater samples collected during 1982, 1983 and 1984.	Groundwater No data collected	Groundwater Volatile Organic Compounds (µg/l) 1,2-Dichloroethene: ND - 20 Trichloroethene: 7 - 10 Benzene: ND - 230 Semi-Volatile Organic Compounds (µg/l) Naphthalene: ND - 2
	Soil Miscellaneous Petroleum Hydrocarbons (mg/kg): 25	Soil Miscellaneous Petroleum Hydrocarbons (µg/g): ND - 1,076

NOTE:

ND = Not Detected

TABLE 7

HISTORICAL SUMMARY OF
ANALYTICAL DATA - SITE 39, AREA B

Pre-1985	Phase I Remedial Investigation	Phase II Remedial Investigation
Groundwater	Groundwater	Groundwater
	Semi-Volatile Organic Compounds (µg/l)	Metals (µg/l)
	Fluoranthene: 6.69 Pyrene: 6.28	Lead: 24 - 60.5
		Volatile Organic Compounds (µg/l)
		1,1,1-Trichloroethane: ND - 2 Trichloroethene: 12 - 25
	Soil	Soil
	Semi-Volatile Organic Compounds (µg/kg)	Semi-Volatile Organic Compounds (µg/kg)
	Fluoranthene: 221 Pyrene: 230	Fluoranthene: ND - 430 Pyrene: ND - 480 Acenaphthalene: ND - 60 Phenanthrene: ND - 280 Benzo(a)anthracene: ND - 220 Chrysene: ND - 300 Benzo(b)fluoranthene: ND - 330 Benzo(k)fluoranthene: ND - 250 Benzo(a)pyrene: ND - 320 Benzo(ghi)perylene: ND - 220

NOTE:

ND = Not Detected

TABLE 8

HISTORICAL SUMMARY OF ANALYTICAL DATA - SITE 12, AREA A-WEST

1983	Phase I Remedial Investigation (1985-86)	Phase II Remedial Investigation (1988)
Groundwater	Groundwater	Groundwater
Volatile Organic Compounds (µg/l)	Volatile Organic Compounds (µg/l)	Volatile Organic Compounds (µg/l)
Tetrachloroethylene: 90		Tetrachloroethylene: ND - 30 Trans-1,3-dichloropropene: ND - 5
1984		Semi-Volatile Organic Compounds (µg/l)
Groundwater		Pentachlorophenol: ND - 3
Volatile Organic Compounds (µg/l)		Miscellaneous (mg/l)
Tetrachloroethylene: 56		Nitrate: ND - 239
	Soil	Soil
	No data collected	Semi-Volatile Organic Compounds (µg/kg)
		Pryene: ND - 180
		Miscellaneous (µg/g)
		Petroleum Hydrocarbons: 4,293.88
	Sediment	Sediment
	No data collected	No contamination detected
	Surface Water	Surface Water
	No data collected	No contamination detected

NOTE:

ND = Not Detected

TABLE 9

HISTORICAL SUMMARY OF
ANALYTICAL DATA - SITE 33, AREA A-WEST

Pre-1985	Phase I Remedial Investigation (1985-86)	Phase II Remedial Investigation (1988)
No data collected		Soil Gas and Groundwater Screening Surveys
		Total chlorinated hydrocarbons in soil gas: ND - 0.03 µg/l
		Total petroleum hydrocarbons in soil gas: 0.02 - 1,700 µg/l
		Groundwater
		Volatile Organic Compounds (µg/l)
		Benzene: ND - 2
		Pesticides/PCBs (µg/l)
		Alpha-BHC: ND - 0.07
	Soil	Soil
		Volatile Organic Compounds (µg/kg)
		Ethylbenzene: 150 - 850 Xylenes: ND - 880 Acetone: ND - 58
		Semi-Volatile Organic Compounds (µg/kg)
		Naphthalene: ND - 2,500 2-Methylnaphthalene: ND - 83,000 Phenanthrene: ND - 400 Fluorene: ND - 40 Fluoranthene: ND - 530 Pyrene: ND - 520 Benzo(a)anthracene: ND - 240 Chrysene: ND - 370 Benzo(b)fluoranthene: ND - 160 Benzo(a)pyrene: ND - 230
	Miscellaneous	Miscellaneous
	Petroleum Hydrocarbons (mg/kg): 1,500 - 3,400	Petroleum Hydrocarbons (µg/g): ND - 205.86
		Dry Well Supernatant
		Volatile Organic Compounds (µg/l)
		1,1-Dichloroethuane: 48

NOTE:

ND = Not Detected

TABLE 10

HISTORICAL SUMMARY OF
ANALYTICAL DATA - SITE 42, AREA A-WEST

Pre-1985	Phase I Remedial Investigation	Phase II Remedial Investigation
		Soil Gas and Groundwater Screening Survey
		Total chlorinated hydrocarbons in soil gas: ND - 1.94 µg/l
		Total petroleum hydrocarbons in soil gas: NE - 2,300 µg/l
		Total petroleum hydrocarbons in groundwater: ND - 37.06 µg/l
		Total petroleum hydrocarbons in groundwater: ND - 1,800 µg/l
Groundwater	Groundwater	Groundwater
Four monitoring wells, AF, AG, CE and CF were installed by NAEC. In 1983 and 1984, tetrachloroethylene was detected in well CF at concentrations of 90 µg/l and 56 µg/l, respectively	Volatile Organic Compounds (µg/l)	Volatile Organic Compounds (µg/l)
	Tetrachloroethylene: ND - 18.2	Benzene: ND - 2 1,2-Dichloroethene: ND - 18 Trichloroethene: ND - 43 Tetrachloroethene: ND - 720 trans-1,3-Dichloropropene: ND - 5
	Miscellaneous	Semi-Volatile Organic Compounds (µg/l)
	Total phenolics (µg/l): ND - 52.9	Pentachlorophenol: ND - 3
		Pesticidies (µg/l)
		Alpha-BHC: ND - 0.07
		Metals (µg/l)
		Lead: ND - 65
		Miscellaneous Parameter (µg/g)
		Petroleum Hydrocarbons: ND - 9,248.13 Chloride: ND - 75 mg/l Nitrate: ND - 635 mg/l Sulfate: ND - 56 mg/l

ND = Not Detected

TABLE 10 (continued)

Soil	Soil
No data collected	Volatile Organic Compounds (µg/kg) Ethylbenzene: 150 - 850 Xylenes: ND - 880 Tetrachloroethene: ND - 110 Semi-Volatile Organic Compounds (µg/kg) Naphthalene: ND - 2,500 2-Methylnaphthalene: ND - 83,000 Phenanthrene: ND - 400 Fluorene: ND - 40 Fluoranthene: ND - 530 Pyrene: ND - 520 Benzo(a)anthracene: ND - 240 Chrysene: ND - 370 Benzo(b)fluoranthene: ND - 160 Benzo(k)fluoranthene: ND - 130 Benzo(a)pyrene: ND - 230 Anathracene: ND - 60 Miscellaneous Parameters Petroleum Hydrocarbons: ND - 9,248.13 µg/g

Sediment	Sediment
No data collected	Semi-Volatile Organic Compounds (µg/kg) 2-Methylnaphthalene: ND - 120 Phenanthrene: ND - 70 Fluoranthene: ND - 140 Pyrene: 81 - 220 Chrysene: ND - 120 Pesticides/PCBs (µg/kg) 4,4'-DDE: ND - 160 4,4'-DDD: ND - 640 4,4'-DDT: ND - 10 Metals (mg/kg) Beryllium: ND - 3.9 Nickel: 20.7 - 234 Vanadium: 210 - 1,293 Miscellaneous Petroleum Hydrocarbons: ND - 474.5 µg/g

NOTE:

TABLE 11

LIST OF ARARS

Only action-specific ARARs, which include surface water, groundwater and air discharge limitations as well as hazardous waste handling requirements, wetland and floodplain requirements, will be complied with during the interim remedial design. Contaminant-specific cleanup levels will be addressed in the final remedy.

The interim remediation activities at Areas A and B will primarily address groundwater. Identification of Federal Action-Specific ARARs applicable to the interim remedial alternative chosen are:

Occupational Safety and Health Act (OSHA) (29 CFR 1910, 1926, 1904): ARARs for workers and workplace throughout the implementation of hazardous activities.

Resource Conservation and Recovery Act (RCRA) (40 CFR 264.10-.77): Potential ARARs for alternatives utilizing treatment, storage or disposal actions (Note: permits not required for on-site actions).

RCRA (40 CFR 264.90-.101): Groundwater protection. Groundwater monitoring/corrective action requirement; dictate adherence to MCLs and establishes points of compliance.

RCRA - Part 263 (CFR 263.10-.31) and Hazardous Materials Transportation Act (49 CFR 170, 171): Transporter Requirements. ARARs for alternatives involving shipment of hazardous materials or wastes.

RCRA - Part 268 (40 CFR 268): Land Disposal Restrictions. Potentially pertains to spent carbon filters and sludge from pretreatment process. Wastes will be tested to determine if they are hazardous waste under RCRA.

Clean Air Act (40 CFR 50): ARARs for alternative which involve treatments which impact ambient air.

Clean Water Act (40 CFR 401): NPDES Permit Requirements. Requirements for point source discharge to surface waters. Potential ARARs which will affect the implementability of remedial action involving effluent discharge to the Manapaqua Brook.

Clean Water Act (40 CFR 404): Prohibits actions that impact a wetland unless no other alternatives are available.

TABLE 11 (continued)

Identification of State Action-Specific ARARs are as follows:

N.J. Hazardous Waste Regulations (NJAC 7:26): Permitting, Contingency Plans, Specification for Treatment/Disposal Units. Potential ARARs for alternatives which involve the treatment, storage or disposal of hazardous wastes. N.J. Clean Water Act (NJAC 7:14A-1.1 et seq.): NJPDES Water quality Toxic Effluent Specification for Treatment/Disposal Units. Potential ARARs for alternatives which involve the treatment, storage or disposal of hazardous wastes. N.J. Clean Water Act (NJAC 7:14A-1.1 et seq.): NJPDES Water quality Toxic Effluent Limitations. ARAR for alternative involving treatments which discharge effluents to surface water.

N.J. Pollutant Discharge Elimination System (NJAC 7:14A-1 et seq.): Permit Requirements. ARAR for alternatives involving treatments which discharge effluent to ground surfaces.

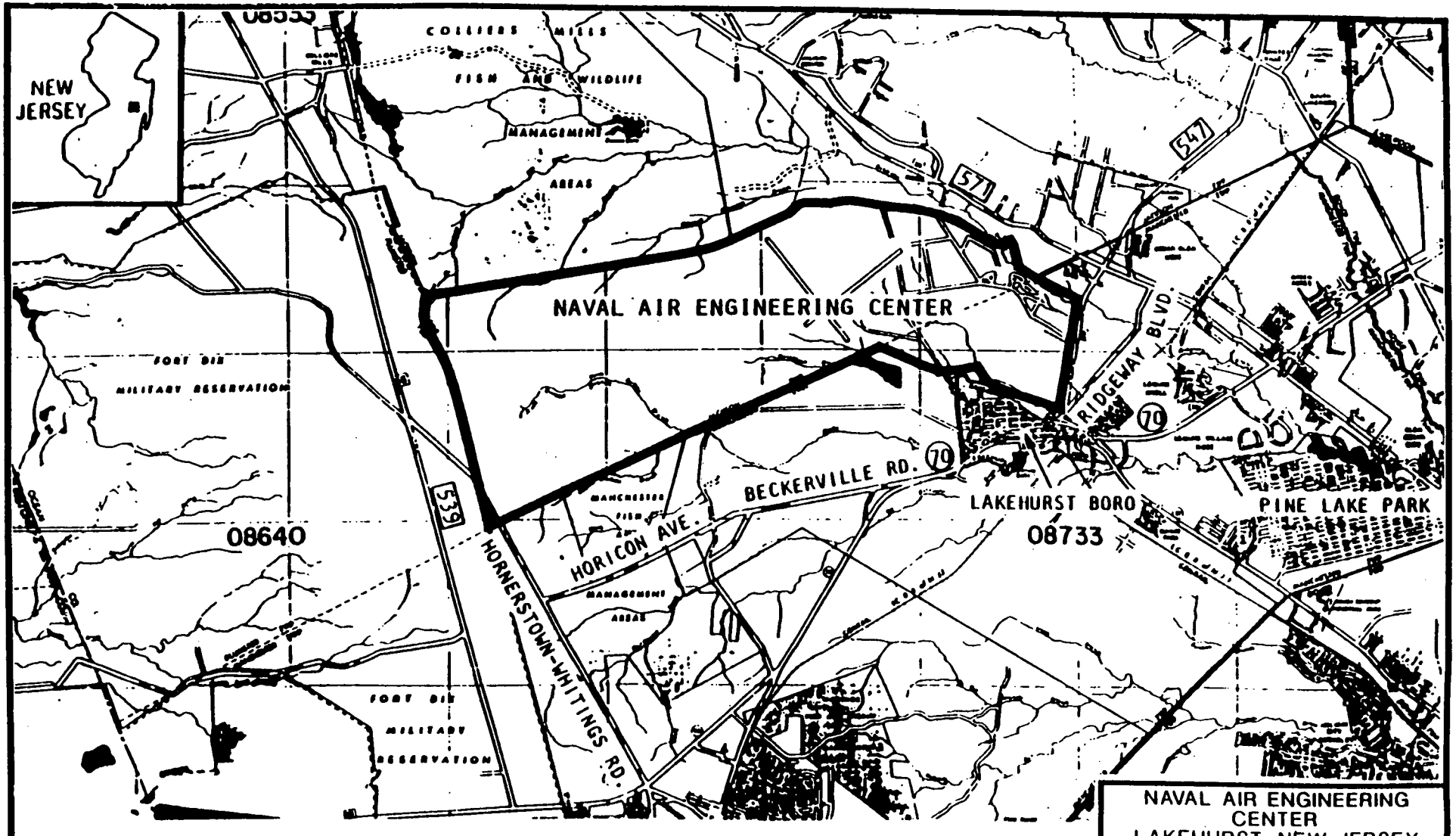
N.J. Surface Water Regulations (NJAC 7:9-5.1): ARARs for alternatives involving treatment which discharge toxic pollutants to area water bodies.

N.J. Air Pollution Control Regulations (NJAC 7:27-16): Permits and Emission Limitation for VOCs. ARARs for alternatives for treatments which impact ambient air.

Endangered Species Action (16 USC 1531): Consultation will be undertaken with the U.S. Fish and Wildlife Service to determine if the remedial action will adversely affect endangered species in the area.

The Pinelands Protection Act (NJSA 18A-1 et. seq.): Consultation will be undertaken with the U.S. Fish and Wildlife Service and Department of the Interior and the affect of the action on wetland areas will be monitored to assure no significant adverse impacts.

The Pinelands Comprehensive Management Plan (NJAC 7:50-1.1 et seq.): Consultation will be undertaken with the U.S. Fish and Wildlife Service and Department of the Interior and the affect of the action on wetland areas will be monitored to assure no significant adverse impacts.



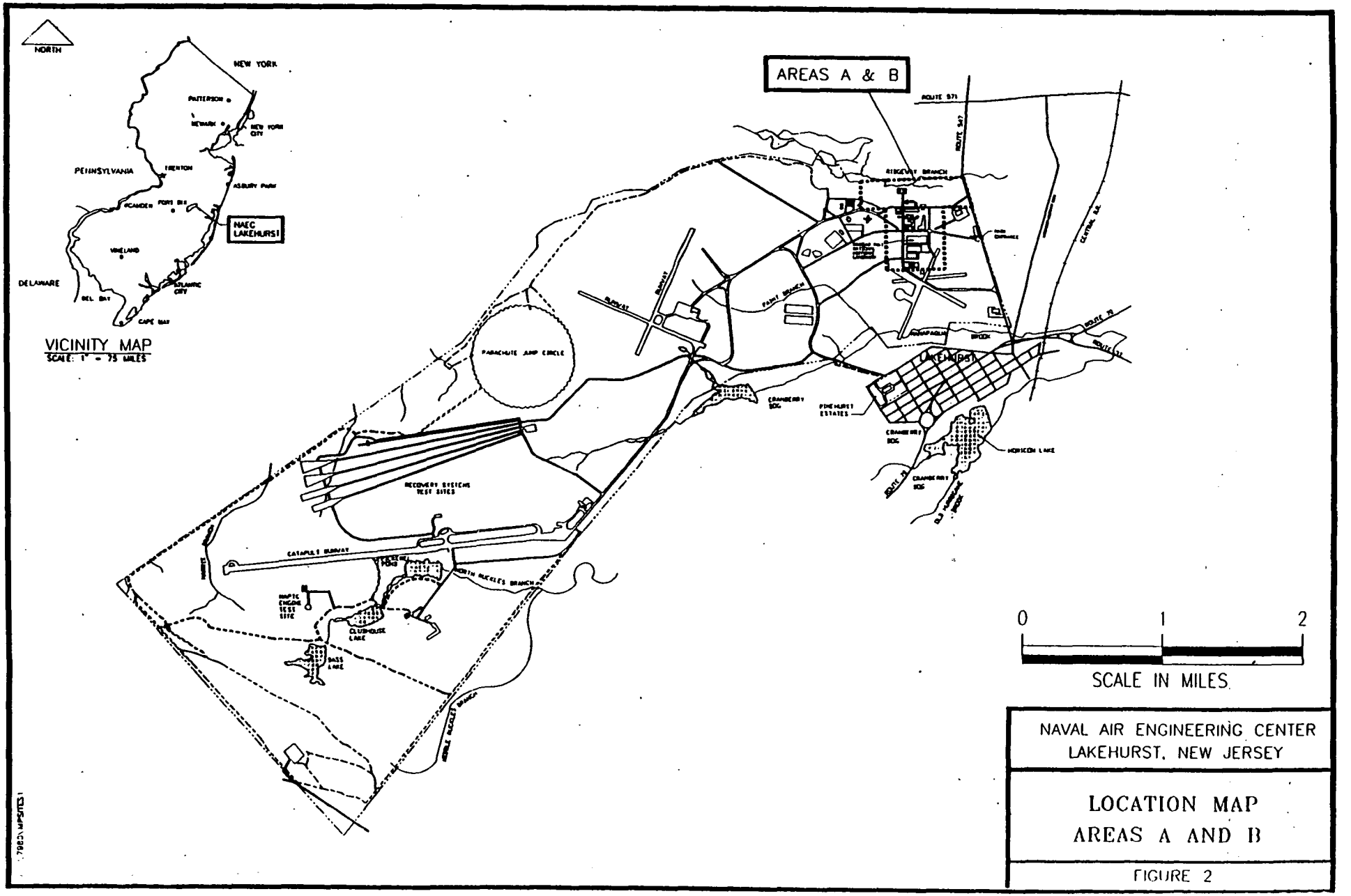
REFERENCE:
HAGSTROM MAP OF
OCEAN COUNTY, NEW JERSEY

NAVAL AIR ENGINEERING CENTER
LAKEHURST, NEW JERSEY

VICINITY MAP

Dames & Moore
CRANFORD, NEW JERSEY

FIGURE 1



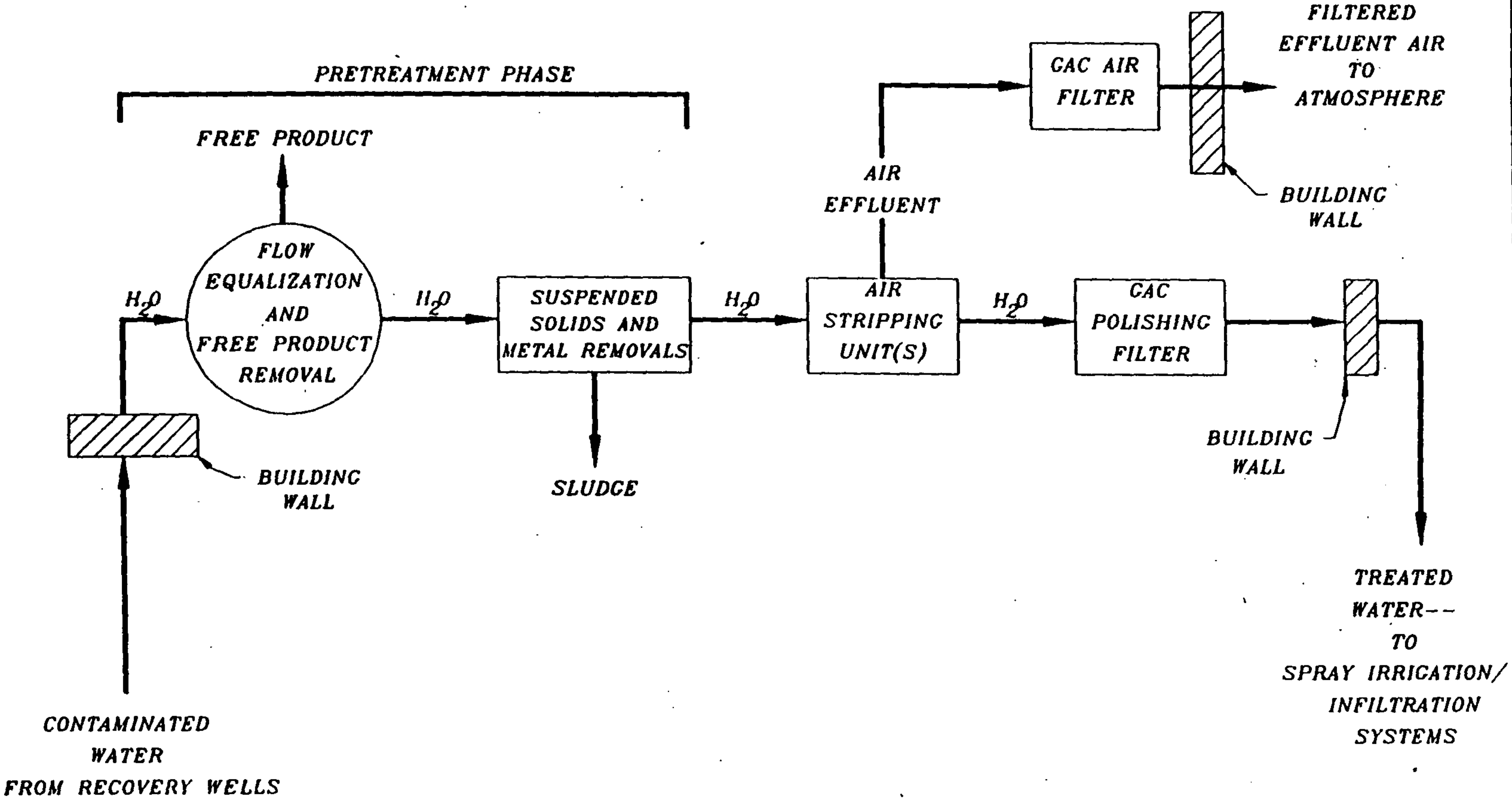
NAVAL AIR ENGINEERING CENTER
LAKEHURST, NEW JERSEY

LOCATION MAP
AREAS A AND B

FIGURE 2

\7980\024-1

PRETREATMENT:METALS AND SOLIDS REMOVAL
AIR STRIPPING UNIT:VOC REMOVAL - 99%
GAC POLISHING FILTER:RESIDUAL VOC REMOVAL
GAC AIR FILTER:VOC REMOVAL FROM AIR EFFLUENT

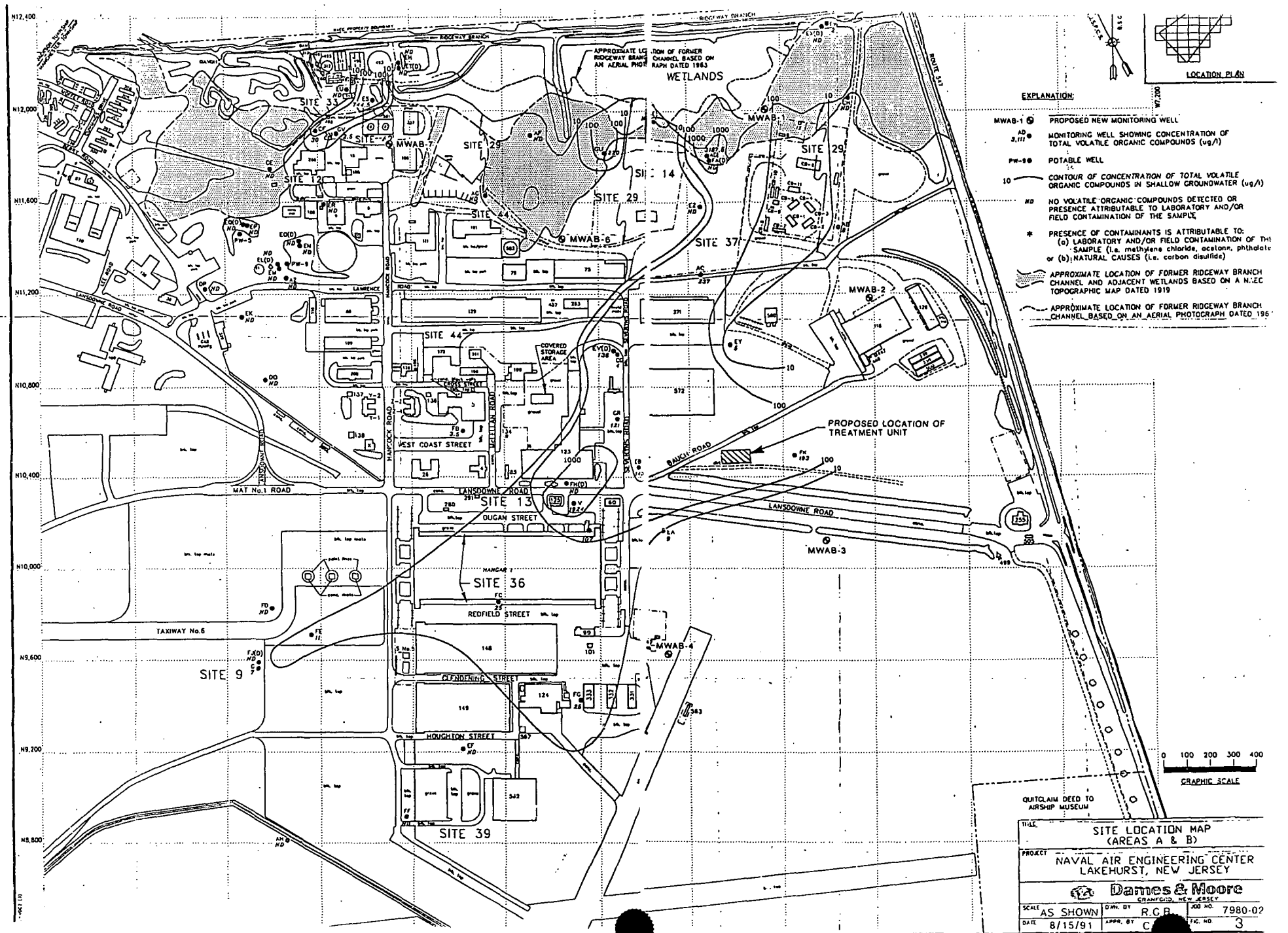


NAVAL AIR ENGINEERING CENTER
LAKEHURST, NEW JERSEY

ALTERNATIVE #2

Dames & Moore
CRANFORD, NEW JERSEY

FIGURE 4

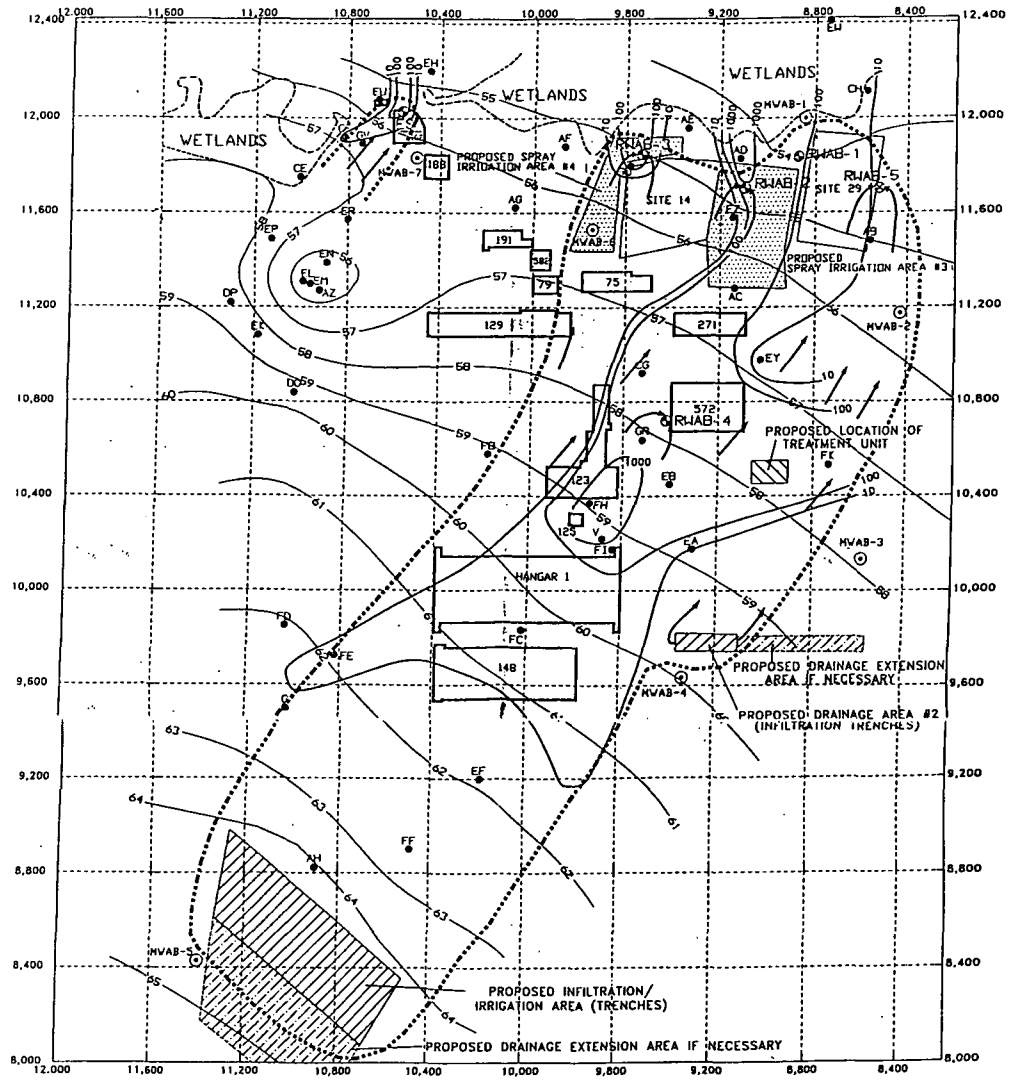


TITLE: SITE LOCATION MAP (AREAS A & B)

PROJECT: NAVAL AIR ENGINEERING CENTER LAKEHURST, NEW JERSEY

Dames & Moore, CRANFORD, NEW JERSEY

SCALE: AS SHOWN	DWN. BY: R.G.B.	JOB NO.: 7980-02
DATE: 8/15/91	APPR. BY: C	FIG. NO.: 3



LEGEND:

- FF ● MONITORING WELL
- MWAB-5 ⊙ PROPOSED MONITORING WELL
- RWAB-4 ⊗ RECOVERY WELL
- RWAB-5 ⊗ PROPOSED RECOVERY WELL
- PROJECTED GROUNDWATER ELEVATION CONTOUR IN FEET ABOVE MEAN SEA LEVEL
- CONTOUR OF ESTIMATED CONCENTRATION OF TOTAL VOLATILE ORGANIC COMPOUNDS IN SHALLOW GROUNDWATER (ug/l) (2nd ROUND OF SAMPLING PHASE II INVESTIGATION)
- PROJECTED CAPTURE ZONE BOUNDARY
- GROUNDWATER FLOW DIRECTION

NOTES:

1) SIMULATION REPRESENTS WATER LEVEL CONTOURS AFTER 1-YEAR OF PUMPING:
   - RWAB-1 AT 125 gpm
   - RWAB-2 AT 125 gpm
   - RWAB-3 AT 50 gpm
   - RWAB-4 AT 80 gpm
   - ES AT 80 gpm
   - RWAB-5 AT 125 gpm

   AND RECHARGING:
   - INFILTRATION/ IRRIGATION AREA #1 AT 585 gpm
   - DRAINAGE AREA #2 AT 50 gpm
   - IRRIGATION AREA #3 AT 100 gpm
   - IRRIGATION AREA #4 AT 100 gpm.
2) STORAGE COEFFICIENT = 0.2
3) THE SIMULATION REPRESENTS OUR EVALUATION OF PROBABLE CONDITIONS BASED UPON THE INTERPRETATION OF PRESENTLY AVAILABLE DATA. SOME VARIATIONS MUST BE EXPECTED.

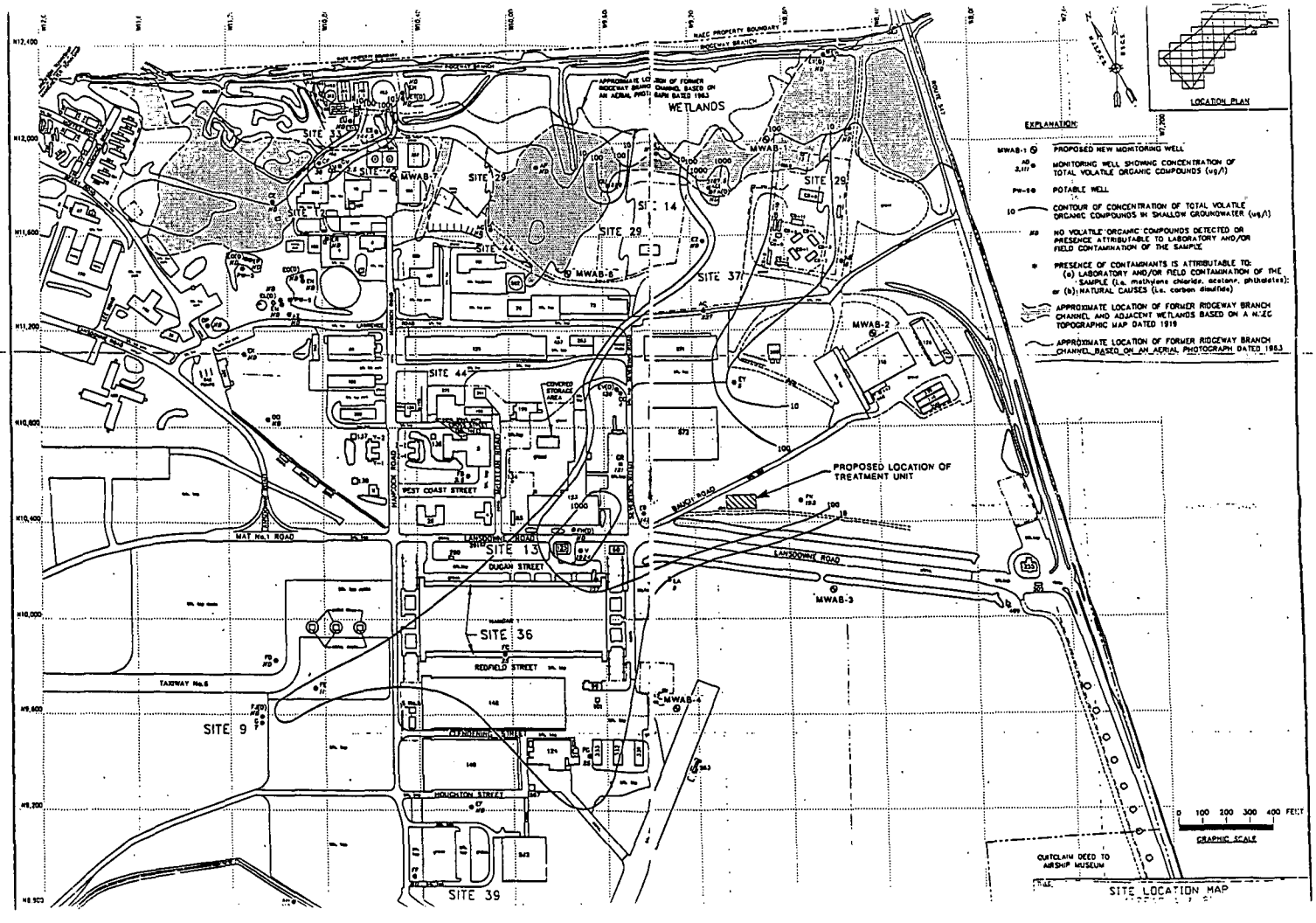
N N

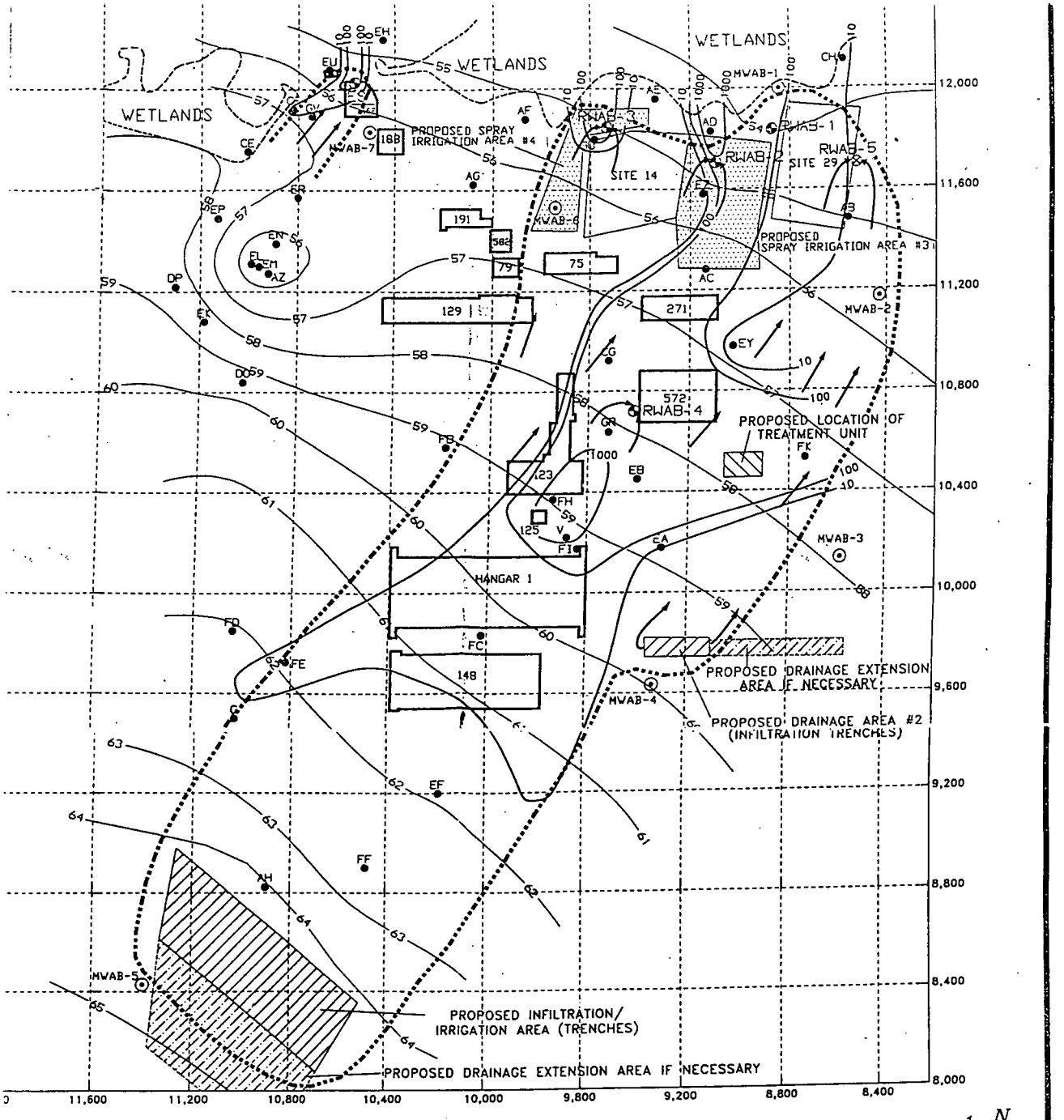
0 300 600 FEET

NAVAL AIR ENGINEERING CENTER
LAKEHURST, NEW JERSEY

SCHEMATIC DIAGRAM OF GROUNDWATER TREATMENT SYSTEM AND PROJECTED ZONE OF CAPTURE/RECHARGE AREAS A & B

DATE: 7/23/91	JOB NO: 07980-027	FIGURE
Dames & Moore CRANFORD, NEW JERSEY		5


WETLANDS
SITE 29
SITE 14
SITE 37
SITE 44
SITE 13
SITE 36
SITE 9
SITE 39
MWAB-1
MWAB-2
MWAB-3
MWAB-4
MWAB-5
MWAB-6
MWAB-7
PROPOSED LOCATION OF TREATMENT UNIT
LANSDOWNE ROAD
BAYOU ROAD
WEST COAST STREET
DUGAN STREET
REDFIELD STREET
HOUGHTON STREET
MAT No.1 ROAD
TAXIWAY No.6
QUITCLAIM DEED TO AIRSHIP MUSEUM
LOCATION PLAN
EXPLANATION:
PROPOSED NEW MONITORING WELL
MONITORING WELL SHOWING CONCENTRATION OF TOTAL VOLATILE ORGANIC COMPOUNDS (ug/l)
POTABLE WELL
CONTOUR OF CONCENTRATION OF TOTAL VOLATILE ORGANIC COMPOUNDS IN SHALLOW GROUNDWATER (ug/l)
NO VOLATILE ORGANIC COMPOUNDS DETECTED OR PRESENCE ATTRIBUTABLE TO LABORATORY AND/OR FIELD CONTAMINATION OF THE SAMPLE
PRESENCE OF CONTAMINANTS IS ATTRIBUTABLE TO: (a) LABORATORY AND/OR FIELD CONTAMINATION OF THE SAMPLE (i.e. methylene chloride, acetone, phthalates); or (b) NATURAL CAUSES (i.e. carbon disulfide)
APPROXIMATE LOCATION OF FORMER RIDGEWAY BRANCH CHANNEL AND ADJACENT WETLANDS BASED ON A N.Y.C. TOPOGRAPHIC MAP DATED 1919
APPROXIMATE LOCATION OF FORMER RIDGEWAY BRANCH CHANNEL BASED ON AN AERIAL PHOTOGRAPH DATED 1963
0 100 200 300 400 FEET
GRAPHIC SCALE
SITE LOCATION MAP



N N

N.J.S.P.C.S. N.S.G.S.

0 300 600 FEET

MONITORING WELL

PROPOSED MONITORING WELL

RECOVERY WELL

PROPOSED RECOVERY WELL

— PROJECTED GROUNDWATER ELEVATION CONTOUR IN FEET ABOVE MEAN SEA LEVEL

\ CONTOUR OF ESTIMATED CONCENTRATION OF TOTAL VOLATILE ORGANIC COMPOUNDS IN SHALLOW GROUNDWATER (ug/l) (2nd ROUND OF SAMPLING PHASE II INVESTIGATION)

•• PROJECTED CAPTURE ZONE BOUNDARY

➢ GROUNDWATER FLOW DIRECTION

NOTES:

1) SIMULATION REPRESENTS WATER LEVEL CONTOURS AFTER 1-YEAR OF PUMPING:
   - RWAB-1 AT 125 gpm
   RWAB-2 AT 125 gpm
   RWAB-3 AT 50 gpm
   RWAB-4 AT 80 gpm
   ES AT 80 gpm
   RWAB-5 AT 125 gpm
   AND RECHARGING:
   INFILTRATION/ IRRIGATION AREA #1 AT 585 gpm
   DRAINAGE AREA #2 AT 50 gpm
   IRRIGATION AREA #3 AT 100 gpm
   IRRIGATION AREA #4 AT 100 gpm.
2) STORAGE COEFFICIENT = 0.2
3) THE SIMULATION REPRESENTS OUR EVALUATION OF PROBABLE CONDITIONS BASED UPON THE INTERPRETATION OF PRESENTLY AVAILABLE DATA. SOME VARIATIONS MUST BE EXPECTED.

NAVAL AIR ENGINEERING CENTER
LAKEHURST, NEW JERSEY

SCHEMATIC DIAGRAM OF GROUNDWATER TREATMENT SYSTEM AND PROJECTED ZONE OF CAPTURE/RECHARGE AREAS A & B

DATE: 7/23/91 | JOB NO: 07980-027 | FIGURE 5

Dames & Moore
CRANFORD, NEW JERSEY