Proposed Remedial Action Plan
for
Site 7 - Fuel Depot

Naval Weapons Industrial Reserve Plan
Calverton, New York

Engineering Field Activity Northeast
Naval Facilities Engineering Command
Contract Number N62472-90-D-1298
Contract Task Order 0189

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PROPOSED REMEDIAL ACTION PLAN
SITE 7 – FUEL DEPOT
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
CALVERTON, SUFFOLK COUNTY, NEW YORK
SEPTEMBER 2001

1.0 SUMMARY AND PURPOSE OF THE PROPOSED PLAN

The Navy, in consultation with the New York State Department of Environmental Conservation (NYSDEC) and U.S. Environmental Protection Agency (EPA), is proposing a remedy to address the significant threat to human health and/or the environment created by the presence of hazardous materials at Site 7 – Fuel Depot at Naval Weapons Industrial Reserve Plant (NWIRP) Calverton. As more fully described in Sections 3.0 and 4.0 of this Proposed Remedial Action Plan (PRAP), historical operations that resulted in hazardous material generation at the facility included, but were not limited to, metal finishing processes, maintenance operations, temporary storage of hazardous waste, fueling operations, painting of aircraft and components, and various training operations. Materials stored at Site 7 included jet fuel, diesel fuel, and gasoline. Contaminants associated with fuel storage operations include non-chlorinated volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs) including polynuclear aromatic hydrocarbons (PAHs), and lead. Some of these contaminants have migrated from the fuel-storage area to soil and groundwater beneath Site 7. Freon was also detected in groundwater at the site.

Fuel storage activities have resulted in the following significant threats to the public health and/or the environment:

- A significant threat to public health associated with contaminated groundwater.
- A significant threat to the environment associated with contaminated groundwater.

In order to eliminate or mitigate the significant threats to public health and/or the environment that fuel storage at Site 7 may have caused, the following remedy is proposed:

- Installation of an air sparging and soil vapor extraction system.
- Operation and maintenance of all operating systems.
- Groundwater monitoring.
- Restrictions on groundwater use.

The proposed remedy, discussed in detail in Section 7.0 of this PRAP, is intended to attain the remediation goals selected in Section 6.0, in conformity with applicable standards, criteria, and guidance (SCGs).

This PRAP identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for this preference. The Navy, in consultation with NYSDEC, Suffolk County Department of Health Services (SCDHS), and New York State Department of Health (NYSDOH) will select a final remedy for the site only after careful consideration of all comments received during the public comment period. This site is not listed on National Priorities List (NPL). However, a copy of this document will be sent to the USEPA Region II offices for information.

The Navy has issued this PRAP as a component of the citizen participation plan developed pursuant to the New York State Environmental Conservation Law and 6 NYCRR Part 375. This PRAP is summary of the information that can be found in greater detail in the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI), Phase 2 RFI, Feasibility Study/Corrective Measures Study (FS/CMS), and other relevant reports and documents available at the document repositories.

To better understand the site and investigations conducted, the public is encouraged to review the project documents at the following repository:

Riverhead Free Library
300 Court Street
Riverhead, New York 11901
Hours: Mon. - Fri. 9am - 9pm
Sat. 9am - 5pm
Sun. 1pm - 5pm (Oct. to May)

The Navy seeks input from the community on all PRAPs. A public comment period has been set from April 2, 2002 to May 3, 2002 to provide an opportunity for public participation in the remedy selection process for this site. A public meeting is scheduled for April 17, 2002 at the Riverhead Town Hall beginning at 7 pm.

At the meeting, the results of the RFI and FS/CMS will be presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period will be held, during which you can submit verbal or written comments on the PRAP.

The Navy, in consultation with NYSDEC and SCDHS, may modify the preferred alternative or select another of the alternatives presented in this PRAP based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives identified here.

Comments will be summarized and responses provided in the Responsiveness Summary section of the Decision Document (DD). The DD is the Navy's final selection of the remedy for this site. Written comments may be sent to Mr. James Colter at the address below through May 2, 2002.

Engineering Field Activity, Northeast
Naval Facilities Engineering Command
Attn: Code EV2/JLC
10 Industrial Highway, Mail Stop 82
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2.0 SITE LOCATION AND DESCRIPTION

NWIRP Calverton is located in Suffolk County, Long Island, approximately 80 miles east of New York City (see Figure 1). NWIRP Calverton consists of four separate parcels of land totaling approximately 358 acres. Eight inactive hazardous waste sites or areas are included within these parcels as follows (see Figure 2):

- Parcel A (32 acres): Site 2 – Fire Training Area
- Parcel B1 (40 acres): Site 6A – Fuel Calibration Area and Site 10B – Engine Test House
- Parcel B2 (131 acres): Southern Area
- Parcel C (10 acres): Site 7 – Fuel Depot and Site 10A – Jet Fuel Systems Laboratory
- Parcel D (145 acres): Site 1 – Northeast Pond Disposal Area and Site 9 – ECM Area

Site 7 is located approximately 3,000 feet north of the south gate near the geographic center of the NWIRP Calverton (see Figure 2). It is located at the eastern side of the road leading from the south gate and is approximately 2 acres in area, measuring 150 feet in width and 400 feet in length (see Figure 3). The principal site features are a large concrete truck parking area covering the southern half of the depot and a gravel and soil covered area where a series of underground storage tanks were located. A fuel pump house is located at the western edge of the fuel depot, and a maintenance garage was located at the southeastern corner.

3.0 SITE HISTORY

3.1 Operational History

The former NWIRP Calverton was owned by the Navy since the early 1950's and originally consisted of approximately 6,000 acres. The Northrop Grumman Corporation (formerly Grumman Aerospace Corporation) was the sole operator of the facility, which was known as a government owned, contractor operated (GOCO) facility. The facility was used in the development, assembly, testing, refitting, and retrofitting of combat naval aircraft. Northrop Grumman ceased operations in February 1996. In September 1998, the majority of land within the fence-in portion of the facility was transferred to the Town of Riverhead for redevelopment. Because of the need for additional environmental investigations and the potential need for remediation, the Navy retained four parcels of land within the developed section listed above. In September 1999, an additional 2,935 acres of undeveloped land outside of the fenced areas was transferred to NYSDEC who will continue to manage the property for resource conservation and recreational uses. An additional 140 acres of the northwest buffer zone was transferred to the Veteran's Administration (VA) for expansion of the Calverton National Cemetery.

Site 7 – Fuel Depot Area was used for the storage and distribution of fuel products, such as JP-4 and JP-5 jet fuel. Fuels were stored in underground storage tanks (USTs). Seven tanks, ranging in size from 4,000 to 15,000 gallons, were originally used for storage of jet fuel and gasoline. More recently, three 50,000-gallon tanks stored jet fuel, two 10,000-gallon tanks stored diesel fuel and gasoline, and one 20,000-gallon tank stored gasoline. The 50,000-gallon tanks were removed in August 1997, and the 10,000-gallon and 20,000-gallon tanks were removed in April 1998. One 550-gallon aboveground storage tank, also removed in April 1998, stored JP-4 jet fuel and was located on a concrete pad east of the pump house. Fuels were transferred from the USTs to trucks. The trucks transported the fuel to the flight preparation areas of the facility.

3.2 Remedial History

The work at Site 7 is part of the Navy's Installation Restoration (IR) Program, which is designed to identify contamination of Navy and Marine Corps lands and facilities resulting from past operations and to institute corrective measures, as needed. There are typically four distinct stages. Stage 1 is the Preliminary Assessment (PA), which was formerly known as the Initial Assessment Study (IAS). Stage 2 is a RCRA Facility Assessment – Sampling Visit (RFA), which is also referred to as a Site Investigation (SI), which augments the information collected in the PA. Stage 3 is the RFI/CMS, also referred to as a Remedial Investigation/Feasibility Study (RI/FS), which characterizes contamination at a facility and develops options for remediation of the site. Stage 4 is the Corrective Action, also referred to as the Remedial Action, which results in the control or cleanup of contamination at sites.

An IAS (or PA) was performed for NWIRP Calverton facility in 1986. This study identified seven potential areas of concern, including Site 7. A follow-up SI (or RFA) was conducted for seven sites, including Site 7. Spills were documented at Site 7, and floating free product was identified in monitoring wells.

An RFI (or RI) was conducted in 1994 and 1995 to define the nature and extent of contamination that was found in previous investigations and estimate potential risks to human health and the environment. A Phase 2 RFI (or Phase 2 RI) was conducted in 1997 to fill data gaps identified after the previous RFI.

An FS/CMS was conducted in 2000 to develop and evaluate remedial alternatives to address the contamination and risks to human health and the environment.

3.3 Enforcement History

NWIRP Calverton is listed on the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites. Remedial work at the facility is being done in accordance with a state permit.

The RFI and Phase 2 RFI were conducted in accordance with the requirements of the previous New York State RCRA Hazardous Waste Permit for the facility (NYSDEC 1-4730-00013/00001-0) dated March 25, 1992. The NYSDEC was the lead oversight agency. This work was also conducted in accordance with the previous EPA facility permit (EPA ID Number NYD003995198) dated May 11, 1992. The EPA supported NYSDEC in its oversight activities. The requirements of both permits are basically the same, although the terminology and format varied.

The FS/CMS was conducted in accordance with the requirements of the NYSDEC Division of Solid & Hazardous Materials Part 373 Permit that was issued to the Navy on April 18, 2000, under the NYSDEC implementing regulations (6 NYCRR Part 621). This permit supercedes and replaces the original Part 373 Permit to Operate a Hazardous Waste Storage Facility that was issued to then Grumman Aerospace Corporation on March 25, 1992. The new permit, issued only to the Department of the Navy, deals exclusively with those Solid Waste Management Units that remain on the former NWIRP Calverton property and any corrective actions that may be required to adequately address each site. Although the Part 373 Permit is the enforceable document governing the Navy's remedial actions, the NYSDEC State Superfund group, located in the Albany office, retains primary responsibility for regulatory oversight of the Navy's actions. As such, the Navy has agreed to a request by the NYSDEC State Superfund group to utilize terminology associated with the NYSDEC State Superfund program that is closely related to the Federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program. The CERCLA terminology parallels the RCRA terminology. The implementation phases of each program have been determined to meet the substantive requirements of both programs and will also satisfy the corrective action requirements included in Module III of the Part 373 Permit.

4.0 SITE CONTAMINATION

To evaluate the contamination present at the site and to evaluate alternatives to address the significant threat to human health and the environment posed by hazardous materials, the Navy has conducted an RI/FS for Site 7.

4.1 Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of soil and groundwater contamination resulting from previous activities at Site 7. The RI was conducted in two phases. The first phase was conducted in 1994 and 1995, and the second phase was conducted in 1997. Two reports entitled "RCRA Facility Investigation for Naval Weapons Industrial Reserve Plant, Calverton, New York, August 1995," and "Phase 2 RCRA Facility Investigation for Site 7 – Fuel Depot Area, Naval Weapons Industrial Reserve Plant, Calverton, New York, January 2000," describe the field activities and findings of the RIs in detail.

An FS/CMS, which is the subject of this PRAP, was prepared to address soil and groundwater contamination. A report entitled "Feasibility Study/Corrective Measures Study for Site 7 – Fuel Depot, Naval Weapons Industrial Reserve Plant, Calverton, New York, January 2001," describes the development and analysis of alternatives in detail.

The following investigatory techniques were used to achieve the goals for the RIs:

- A soil gas survey was conducted to identify potential soil and groundwater volatile organic contamination.

- Soil samples were collected to confirm the results of the soil gas survey. Additional soil samples were collected from the bottom of the excavation when the 50,000-gallon USTs were removed to refine the magnitude of contamination in the source area.

- Groundwater samples were collected from monitoring wells that were installed as part of the investigations. Temporary monitoring wells were installed to determine the extent of groundwater contamination and aid in the placement of permanent monitoring wells.

To determine whether the soil and groundwater was contaminated at levels of concern, the RI analytical data were compared to environmental SCGs. A human health risk assessment was also conducted. Soil SCGs are based on NYSDEC Technical and Administrative Guidance Memorandum on Determination of Soil Clean-up Objectives and Clean-up Levels (TAGM 4046). Soil SCGs are based on protection of groundwater and protection of human health. Groundwater SCGs are based on Federal drinking water standards, Part 5 of the New York State Sanitary Code (state drinking water standards), and NYSDEC ambient groundwater quality standards and guidance values.

Based on the RI results, in comparison to the SCGs and potential public health and environmental exposure routes, the soil and groundwater requires remediation. The RI results are summarized below. More detailed information can be found in the RFI and Phase 2 RFI reports on file in the document repositories.

4.1.1 Site Geology and Hydrogeology

NWIRP Calverton is underlain by the following five geologic/hydrogeologic formations (descending from ground surface):

- Upper Glacial Formation (Upper Glacial aquifer) consisting of silty, fine-grained sand with varying amounts of peat and clay near the ground surface and fine-grained sand with varying amounts of medium- to coarse-grained sand and pebbles farther below the ground surface.

- Magothy Formation (Magothy aquifer) consisting of stratified, fine to coarse sand and gravel.

- Raritan Clay Member of the Raritan Formation consisting of clay and silty clay.

- Lloyd Sand Member of the Raritan Formation (Lloyd Sand aquifer) consisting of fine to coarse sand and gravel.

- Bedrock.

The Upper Glacial Formation, the Magothy Formation, and Lloyd Sand are the major regional aquifers and a sole source of drinking water for residents of Long Island. The Upper Glacial and the Magothy aquifers are of principal importance in Suffolk County because of their proximity to the land surface. They are used the most as a source of drinking water. The Lloyd Sand aquifer is not widely used because of its depth and the abundant water available in the overlying aquifers. The Upper Glacial and Magothy aquifers are believed to be hydraulically interconnected and to function as a single unconfined aquifer.

The confining nature of the Raritan Clay is believed to minimize potential contamination to the underlying Lloyd Sand aquifer.

4.1.2 Nature of Contamination

As described in the RFI reports, soil and groundwater samples were collected at the site to characterize the nature and extent of contamination. The main categories of contaminants that exceed their SCGs are VOCs, PAHs, and inorganics (lead).

A summary of the soil analytical data generated during the RI is presented in Table 1. The primary soil contaminants are VOCs and PAHs that were present in the fuels stored at the site. The VOCs are ethylbenzene and xylenes. The PAHs are anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene. Most of the exceedances of SCGs were for samples collected beneath the former USTs.

Several rounds of groundwater sampling were conducted during the RI. This included the sampling of temporary and permanent monitoring wells. Table 2 shows the chemicals detected in groundwater at concentrations above the SCGs. The maximum concentration detected at the site is also provided. The primary groundwater contaminants are VOCs, PAHs, and lead. The VOCs are benzene, toluene, ethylbenzene, and xylenes (BTEX compounds) and freon. The PAHs are 2-methylnaphthalene and naphthalene. Lead was only detected in one well at a concentration greater than the SCG.

Floating free product was identified at the site in 1989. Recovery of free product was conducted by Northrop Grumman until 1995 and, since then, a separate floating free product layer has not been identified at the site.

4.1.3 Extent of Contamination

PAHs and phthalates were detected at several locations throughout the site. The phthalates were not detected at a concentration above the SCG. The highest concentrations of PAHs were found at depth near the water table (14 to 16 feet deep). These concentrations correspond to the location of the former floating free product layer.

The RI determined that there are two separate groundwater plumes at the site. The larger plume contains fuel-related chemicals, and the smaller plume contains freon. The larger groundwater plume is approximately 520 feet long and 220 feet wide (2.6 acres). The smaller plume is approximately 120 feet long and 60 feet wide (0.17 acre). The estimated extent of groundwater contamination is shown on Figure 4.

4.2 Interim Remedial Measures

An interim remedial measure is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS. The only interim remedial measure conducted at Site 7 was floating free product recovery. Floating free product recovery was identified at Site 7 in 1989. The location of the free product corresponded to the location of the most contaminated groundwater. Northrop Grumman recovered floating free product for several years until 1995. Their efforts yielded recovery of approximately 175 gallons of free product. In 1999, the Navy conducted recovery tests and determined that there was no recoverable product remaining. A separate floating free product layer has not been identified at the site since 1995.

4.3 Summary of Human Exposure Pathways

This section describes the types of human exposures that may present added health risks to persons at or around the site. A baseline human health risk assessment was conducted during the RFI. A more detailed discussion of the potential health risks can be found in Section 7.6 of the RFI Report entitled "Baseline Risk Assessment."

An exposure pathway is the manner by which an individual may be exposed to a contaminant. The five elements of an exposure pathway are as follows: source of contamination, environmental media and transport mechanisms, point of exposure, route of exposure, and receptor population. These elements of an exposure pathway may be based on current or future events.

The potential receptor evaluated for the current land use scenario was a maintenance worker performing work tasks near Site 7. The exposure pathway for the maintenance worker includes direct contact with (dermal absorption), ingestion of, and inhalation of contaminated soil 250 days per year over a 25 year period. According to the risk assessment, no unacceptable health risks to current workers would be expected.

Risks to hypothetical receptors assuming a future residential land use scenario were also evaluated. The exposure pathways for this receptor are direct contact with (dermal absorption), ingestion of, and inhalation of contaminated soil and contaminated groundwater. Carcinogenic health risks were within the EPA target risk range. Noncarcinogenic risks were only identified for a child resident and were associated with exposure to groundwater.

4.4 Summary of Environmental Exposure Pathways

There are no wetlands, surface water, aquatic communities, special status species, or unique terrestrial communities located on or adjacent to contaminated areas at this site. Therefore, it was concluded that there is negligible risk to wildlife in the area from exposure to chemicals detected at the site.

5.0 ENFORCEMENT STATUS

The RCRA permit issued to the Department of the Navy deals with those Solid Waste Management Units that remain on the former NWIRP Calverton property and any corrective actions that may be required to adequately address each site.

6.0 SUMMARY OF THE REMEDIATION GOALS

The overall remedial goal is to meet all SCGs and be protective of human health and the environment. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the chemicals detected at the site through the proper application of scientific and engineering principals.

The remediation goals selected for soil at this site are as follows:

- Prevent human exposure (ingestion, dermal contact, dust inhalation) to contaminated soils in concentrations greater than the soil SCGs.

- Prevent leaching of contaminants at resultant groundwater concentrations in excess of groundwater SCGs.

- Comply with chemical-specific, location-specific, and action-specific applicable or relevant and appropriate requirements (ARARs) and guidance.

The remediation goals selected for groundwater are as follows:

- Prevent human exposure (ingestion, dermal contact, inhalation) to groundwater having contaminant concentrations greater than the SCGs.

- Restore contaminated groundwater quality to the SCGs to the maximum extent that is technically feasible.

- Comply with chemical-specific, location-specific, and action-specific applicable or relevant and appropriate requirements (ARARs) and guidance.

If groundwater SCGs cannot be achieved or the aquifer cannot be restored, then at a minimum, the following remediation goals should be met:

- Reduce human exposure (ingestion, dermal contact, inhalation) to groundwater having contaminants in concentrations greater than SCGs.
- Prevent further migration of contaminants.

7.0 SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost effective, comply with other statutory laws, and utilize permanent solutions, alternative technologies, or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for Site 7 were identified, screened, and evaluated in the report entitled "Feasibility Study/Corrective Measures Study for Site 7 – Fuel Depot, Naval Weapons Industrial Reserve Plant, Calverton, New York, January, 2001."

Remedial alternatives for groundwater were developed and evaluated in the FS. Separate alternatives were not developed for soil based on the following factors:

- The soil contaminants were detected at the groundwater interface, and the source was the former floating product layer.

- The contaminated soil was detected at depths greater than 14 feet. This depth effectively eliminates direct contact with the contaminants.

- The VOCs detected at concentrations above SCGs would be effectively addressed by active groundwater remediation technologies or would be expected to biodegrade naturally.

- The SVOCs detected in soil at concentrations above SCGs were not detected in groundwater at concentrations above groundwater SCGs. None of the SVOCs was detected in soil at a concentration higher than that recommended for protection of groundwater.

- The concentrations of PAHs in soil are expected to biodegrade naturally, although slowly. Half-lives for the PAHs detected in soil at concentrations higher than SCGs range from 1.45 years for benzo(a)pyrene to 5.86 years for benzo(k)fluouranthene.

- The groundwater alternatives will also address existing soil contamination.

A summary of the detailed analysis follows. As presented below, the time to implement reflects only the time required to put the remedy in place. It does not include the time required to design the remedy or procure contracts for design and construction.

7.1 Description of Remedial Alternatives

The potential remedies are intended to address the contaminated groundwater at the site.

7.1.1 Alternative 1: No Action

This alternative is the baseline alternative to which the other alternatives will be compared. Under this alternative, no additional remedial actions would be implemented. This alternative would leave the site in its present condition and would not provide any additional protection of human health or the environment. There are no costs associated with the no-action alternative.

7.1.2 *Alternative 2: Institutional Controls and Natural Attenuation*

This alternative consists of natural attenuation and institutional controls (i.e., monitoring of natural attenuation and site development restrictions). This alternative would monitor natural attenuation of groundwater contaminants. Approximately four new monitoring wells would be installed. Groundwater monitoring would be conducted quarterly for the first year and annually for the next 30 years. Modeling would be conducted to estimate contamination migration and natural attenuation. Site development restrictions would be implemented in the facility transfer documents. A reevaluation of the site would be performed every 5 years to determine whether any changes to the controls or remedy would be required. Modeling conducted for the FS predicted that it could take over 100 years to attain the SCGs for some chemicals.

The estimated costs for Alternative 2 are as follows:

Capital Cost:	$70,300
O&M Cost:	$0
Monitoring Cost:	$220,000/yr (Year 1); $79,400/yr (Years 2 through 30)
Present Worth:	$1,230,000

7.1.3 Alternative 3: Groundwater Extraction, Treatment, and Discharge

Plume remediation would be used to accelerate the cleanup of groundwater and ensure that contaminated groundwater is not migrating off site. Soil would be addressed through natural degradation processes including biodegradation and flushing to groundwater. Five groundwater extraction wells would be used. One well would be located near the downgradient edge of the larger plume to contain contaminated groundwater from migrating off site. Three wells would extract highly contaminated groundwater. One extraction well would be placed in the area contaminated only with freon. The total flow rate for the groundwater extraction system was estimated to be 40 gallons per minute.

Extracted groundwater would be treated to meet SCGs prior to reinjection. The treatment system would consist of the following unit operations: equalization, precipitation, clarification, filtration, and air stripping. Air stripping would be used to remove VOCs. Precipitation, clarification, and filtration would be used if necessary to remove metals or other solids that could interfere with air stripping. Based on the low volume of treated groundwater and low VOC concentrations, treatment of off-gas from the air stripper may not be required. Granular activated carbon could also be used to remove organics. Pretreatment using precipitation, clarification, and filtration would be used if necessary to remove metals or other solids that could interfere with air stripping (or activated carbon). Residuals generated during pretreatment would be disposed off site. After treatment, the treated groundwater would be reinjected into the aquifer. The reinjection wells would be placed to enhance contaminant removal.

Groundwater monitoring would be conducted quarterly for the first year and annually thereafter. Groundwater analytical data would be reviewed periodically to evaluate the effectiveness of the groundwater extraction system. If after 4 years of operation groundwater cleanup is not complete or contaminant removal has become inefficient, then the remedy may become institutional controls and natural attenuation (Alternative 2). Modeling conducted for the FS predicted that SCGs for BTEX compounds could be attained in 10 years or less by natural attenuation if the contaminant mass was reduced by 90 percent at the source.

The estimate costs for Alternative 3 are as follows:

Capital Cost:	$2,240,000
O&M Cost:	$150,000/yr (30 years)
Monitoring Cost:	$116,000/yr (Year 1); $55,900/yr (Years 2 through 30)
Present Worth:	$4,900,000

7.1.4 Alternative 4: Air Sparging/Bioventing

Alternative 4 was developed as an in-situ treatment alternative. This alternative consists of installing an air sparging/bioventing system and conducting short-term groundwater monitoring. Air sparging would be used in combination with soil vapor extraction to remove volatile contaminants from the groundwater. Soil vapor extraction would remove the volatilized contaminants as they move through unsaturated soil. The addition of air would also enhance biological activity in groundwater and soil. The treatment system would be installed to treat soil and groundwater within an area of approximately 2.8 acres, which corresponds to the extent of groundwater contamination shown on Figure 4.

In the air sparging system, approximately 340 cubic feet per minute of air would be injected into the saturated zone. Approximately 56 air injections wells would be installed to a depth of 10 to 20 feet below the water table. Air injection causes volatilization of VOCs and supplies oxygen to enhance the biodegradation in the groundwater and capillary zone. Approximately 30 vapor extraction wells would be installed in the vadose zone to remove the VOCs released from the groundwater and contaminated soils and biodegradation products. Horizontal spacing between wells would be designed to ensure that there are no contaminated areas left untreated and to minimize overlap of treatment zones. The contaminated air stream would then be treated. Gas phase granular activated carbon was assumed based on anticipate air stream contaminant concentrations. Spent carbon would be regenerated off site.

Groundwater monitoring would be conducted quarterly for the first year and annually thereafter. Groundwater analytical data would be reviewed periodically to evaluate the effectiveness of the treatment system. If after 4 years of operation groundwater cleanup is not complete or contaminant removal has become inefficient, then the remedy may become institutional controls and natural attenuation (Alternative 2). Modeling conducted for the FS predicted that SCGs for BTEX compounds could be attained in 10 years or less by natural attenuation if the contaminant mass was reduced by 90 percent at the source.

The estimate costs for Alternative 4 are as follows:

Capital Cost:	$700,000
O&M Cost:	$59,400/yr (4 years)
Monitoring Cost:	$78,000/yr (Year 1); $42,280/yr (Years 2 through 30)
Present Worth:	$1,570,000

7.1.5 Alternative 5: Bioremediation with Oxygen Releasing Compounds

Alternative 5 was developed as an active in-situ bioremediation alternative to avoid extracting contaminated groundwater or air. This alternative consists of adding oxygen releasing compounds (ORC) to the groundwater and groundwater monitoring. The ORC would be installed to treat groundwater within an area of approximately 2.8 acres, which corresponds to the extent of groundwater contamination shown on Figure 4.

The ORC provides oxygen to the indigenous microorganisms and enhances their ability to degrade contaminants. The addition of ORC has been demonstrated to remediate fuel contaminated groundwater. However, biodegradation of freon is not expected. The ORC can be added through drive point injection, placement of ORC socks or briquettes into existing wells, or installing borings or trenches to place ORC in contact with the groundwater. The FS assumed that ORC would be added using wells installed on 5-foot centers. The ORC would be added periodically over a 4-year period. Site development restrictions would be implemented into the facility transfer documents. A reevaluation of the site would be performed every 5 years to determine if any changes in the controls would be required.

Groundwater monitoring would be conducted quarterly for the first year and annually thereafter. Groundwater analytical data would be reviewed periodically to evaluate the effectiveness of the ORC in enhancing the biodegradation of the petroleum contamination. If after 4 years of operation groundwater cleanup is not complete or contaminant removal has become inefficient, then the remedy may become institutional controls and monitoring (Alternative 2). Modeling conducted for the FS predicted that SCGs for BTEX compounds could be attained in 10 years or less by natural attenuation if the contaminant mass was reduced by 90 percent at the source.

The estimate costs for Alternative 5 are as follows:

Capital Cost:	\$3,800,000
O&M Cost:	\$0
Monitoring Cost:	\$80,160/yr (Year 1); \$55,000/yr (Years 2 through 30)
Present Worth:	\$4,500,000

7.2 Evaluation of Remedial Alternatives

The criteria used to compare the potential remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous substance sites in New York State (6 NYCRR Part 375). For each of the criteria, a brief description is provided followed by an evaluation of the alternatives against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is included in the FS.

The first two evaluation criteria are termed threshold criteria and must be satisfied for an alternative to be considered for selection. The next five primary balancing criteria are used to compare the positive and negative aspects of each of the remedial strategies. The final criterion is considered a modifying criterion and is taken into account after evaluating those above. It is evaluated after public comments on the PRAP have been received.

7.2.1 Compliance with New York State Standards, Criteria, and Guidance

Compliance with SCGs addresses whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance. The most significant groundwater SCGs for this PRAP are the New York State Drinking Water Supply Regulations (10 NYCRR Part 5) and the NYSDEC Groundwater Quality Standards (6 NYCRR Part 703). The most significant soil SCGs are provided in the NYSDEC Technical and Administrative Guidance Memorandum on Determination of Soil Clean-up Objectives and Clean-up Levels (TAGM 4046). Air Quality Regulations (6 NYCRR Part 200 series) are relevant to air discharges from the groundwater treatment systems.

Alternative 1 would not be compliant with SCGs for groundwater.

In the short term, Alternative 2 would not be compliant with SCGs for groundwater. It is anticipated that groundwater would eventually achieve SCGs because the contaminants present are biodegradable or subject to other natural attenuation processes. However, the time required and the potential for contamination to spread to a new area is uncertain. Modeling conducted for the FS predicted that it could take over 100 years to attain SCGs for some BTEX compounds.

Alternatives 3 and 4 would be compliant with SCGs for groundwater. The groundwater treatment system (Alternative 3) and soil vapor extraction system (Alternative 4) would be designed to be compliant with the NYSDEC Part 200 Air Quality Regulations.

Alternative 5 would be compliant with most SCGs for groundwater. Freon would not be effectively removed by ORC; however, it is anticipated that natural attenuation would eventually reduce the freon concentration to the SCG.

None of the alternatives includes active measures to specifically address SCGs for soil. None of the chemicals that were detected in soil were detected in groundwater above the SCGs for groundwater. Some SVOCs would remain in soil near the water table. These SVOCs are primarily PAHs, which are naturally biodegradable, but over relatively long periods. The addition of air under Alternative 4 or the addition of ORC under Alternative 5 would be expected to enhance the biodegradation rate.

7.2.2 Protection of Human Health and the Environment

This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

Contamination at the site would not be expected to pose a current or future potential risk to ecological receptors.

For all alternatives, some SVOCs would remain in soil near the water table. These SVOCs are primarily PAHs, which are naturally biodegradable, but over relatively long periods. The PAHs are at depth near the water table and only represent potential risk under a long-term direct contact scenario, which is unlikely. However, land use restrictions would be implemented to prevent exposure.

Under current conditions, Alternative 1 would be protective of human health because site groundwater is not used as a source of drinking water. This alternative would not protect human health if groundwater were used for potable purposes in the future. In addition, the potential for off-site contaminant migration would not be monitored.

Alternative 2 would protect human health by limiting site access, land use, and groundwater use. The contaminant concentrations at the site and the potential for contaminant migration would be monitored.

Alternative 3 would protect human health and the environment by containing and treating contaminated groundwater. Restrictions on groundwater use would be implemented to prevent exposure to contaminated groundwater during the remediation process.

Alternative 4 would protect human health and the environment by treating the organic contamination in place. Air sparging would volatilize or degrade the majority of the groundwater contaminants. Restrictions on groundwater use would be necessary until contaminant concentrations are below SCGs.

Alternative 5 would protect human health and the environment by treating most of the organic contamination in place. ORC assisted bioremediation would degrade the majority of the groundwater contaminants. It would not be effective for the freon plume. Restrictions on groundwater use would be necessary until contaminant concentrations are below SCGs.

7.2.3 Short-term Effectiveness

The potential short-term adverse impacts on the remedial action upon the community, the workers, and the environment during construction and implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

No short-term impacts to the community or environment would be expected to occur as the result of implementing any of the alternatives.

No short-term impacts to the workers would be expected to occur as the result of implementing Alternative 1. Short-term impacts to the workers from potential exposure to contaminated media under Alternatives 2 through 5 would be controlled by the use of personal protective equipment and appropriate health and safety training.

Alternative 4 would remove the majority of the contaminants in the quickest time frame (approximately 2 to 5 years), and Alternative 5 should be able to remediate the site in 3 to 10 years. However, SVOC contamination may not be addressed within these times for either alternative. Groundwater cleanup under Alternative 3 may take more than 30 years. For Alternatives 1 and 2, groundwater modeling conducted for the FS predicted that it could take over 100 years to attain SCGs for some BTEX compounds.

7.2.4 Long-term Effectiveness and Permanence

This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on site after the selected remedy has been implemented, the following items are evaluated: the magnitude of the remaining risks, the adequacy of the controls intended to limit the risk, and the reliability of these controls.

For Alternative 1, the future potential threat to human health would remain because there would be no land use or groundwater use controls. Organic contaminants would remain in groundwater above SCGs except for any decrease through natural attenuation. The long-term effectiveness would not be known because no monitoring would be conducted.

Although no removal would occur under Alternative 2, potential threats to human health would be minimized. This limited action alternative would use institutional controls such as NWIRP Calverton transfer documents to limit future use of the site. Institutional controls have uncertain long-term effectiveness. The protection of future human receptors would depend on effective administrative and management of the transfer documents. New areas could be impacted if the contaminated groundwater migrates faster than it is attenuating. Monitoring would be conducted to address this concern, evaluate the effectiveness of natural attenuation, and determine whether additional actions would be required.

Alternatives 3, 4, and 5 would provide for good long-term effectiveness. Groundwater extraction (Alternative 3) can be very effective at containing contaminated groundwater. Air sparging (Alternative 4) can be very effective in treating groundwater contaminated with VOCs and SVOCs. Bioremediation using ORC can be very effective in treating groundwater contaminated with fuel-related VOCs. Freon would not be effectively treated using bioremediation. Monitoring would be conducted to determine the effectiveness of these alternatives.

For Alternatives 3, 4, and 5, groundwater extraction and in-situ treatment can result in residual contaminant concentrations leveling off at relatively low concentrations that are greater than the SCGs. If this occurs, these alternatives include provisions for switching to monitoring natural attenuation (Alternative 2).

7.2.5 Reduction of Toxicity, Mobility, or Volume

Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility, or volume of the wastes at the site.

Alternatives 1 and 2 do not include treatment to reduce toxicity, mobility, or volume.

Alternative 3 includes treatment of extracted groundwater before it is reinjected. Alternative 4 (air sparging) and Alternative 5 (ORC) include in-situ treatment of contaminated groundwater.

7.2.6 Implementability

The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction and ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc.

Alternative 1 is readily implementable because no actions would occur.

Alternative 2 is expected to be readily implementable because the site is located within a controlled facility, where local rules and local ordinances can be strictly enforced. Restrictions for future property use would involve legal assistance and regulatory approval. Provisions in NWIRP Calverton transfer documents would be defined and enforced relatively easily because the site is located within a Federal facility. Sampling and analysis are also readily implementable.

Alternatives 3 and 4 are readily implementable. Drilling contractors and equipment are readily available for well construction. The remedial technologies are well proven and established in the remediation and construction industries. Treatment and disposal facilities are available for any treatment residuals that would be generated during remediation. Sampling and analysis are also readily implementable.

Alternative 5 is readily implementable. It involves using an innovative technology (i.e., ORC). Contractors and equipment are available for well installation and injection of the ORC. This technology has been shown to be viable for petroleum contaminated groundwater. Sampling and analysis are also readily implementable.

7.2.7 Cost

Capital and operating and maintenance costs are estimated for each alternative and compared on a present worth basis. Although cost is the last balancing criteria evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision. The costs for each alternative are presented in Table 3.

7.2.8 Community Acceptance

Concerns of the community regarding the RI/FS reports and the PRAP are evaluated. A Responsiveness Summary will be prepared that describes public comments received and the manner in which the Navy will address the concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

8.0 SUMMARY OF THE PROPOSED REMEDY

Based upon the results of the RI/FS, the evaluation presented in Section 7.0, and the reasons presented below, the Navy is proposing Alternative 4, as described in detail in this PRAP. The proposed remedy, Alternative 4, consists of air sparging, soil vapor extraction, institutional controls in land and groundwater use, operation and maintenance of the treatment system, and long-term groundwater monitoring. The air sparging/soil vapor extraction system is depicted on Figures 5 and 6. If after 4 years of operation, groundwater clean-up is not complete and contaminant removal has become inefficient, then the remediation would switch to Alternative 2 (Institutional Controls and Natural Attenuation). If significant mass removal is continuing to occur, then the air sparging/soil vapor extraction system may continue to operate.

The Alternative 4 selection is based on the evaluation of each of the five alternatives developed for this site. It was determined that Alternative 4 would meet SCGs, prevent exposure to site-related contaminants in the soil and groundwater, actively restore a natural resource (sole source aquifer), and prevent further deterioration of downgradient groundwater conditions.

Off-site groundwater would be protected by a long-term monitoring program that includes sampling of downgradient groundwater monitoring wells. The preference to significantly reduce the toxicity, mobility, or volume of groundwater contaminants is satisfied by this remedy because air sparging would reduce the mass of VOCs in the groundwater. The addition of air will also stimulate biodegradation of organics detected in soil near the water table. The remedial goal for attainment of groundwater SCGs would be met, to the extent practicable.

The estimated present worth cost to implement the remedy proposed in this PRAP is $1,570,000. The cost to construct the remedy is estimated to be $700,000. The estimated annual cost for operation and maintenance is $59,000 per year for 4 years. The estimated annual monitoring cost is $78,400 for Year 1 and $42,280 per year for Years 2 through 30. The present worth cost also includes $20,000 for each 5-year review.

The elements of the proposed remedy are as follows:

- A remedial design program to verify the components of the conceptual design and provide details necessary for the construction, operation and maintenance, and monitoring of the remedial program. Any uncertainties identified during the RI/FS would be resolved.

- Installation of approximately 56 air injection wells to a depth of 10 to 20 feet below the water table. Approximately 340 cubic feet per minute of air would be injected into the saturated zone.

- Installation of approximately 30 soil vapor extraction wells in the vadose zone. The soil vapor extraction rate would be approximately 1.1 to 1.5 times the air injection rate.

- Installation of air emission controls, if required, to comply with NYSDEC and any other applicable air regulations.

- Operation and maintenance of the treatment system for approximately 4 years.

- Long-term groundwater monitoring. Testing would be done, at a minimum, on a quarterly basis for the first year and on an annual basis thereafter.

- A performance evaluation conducted at least every 5 years to determine whether the remedial goals have been achieved and whether monitoring should continue.

GLOSSARY OF TERMS

ARAR	applicable or relevant and appropriate requirement
BTEX	benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMS	Corrective Measures Study
EPA	Environmental Protection Agency
FS	Feasibility Study
GOCO	government owned, contractor operated
IAS	Initial Assessment Study
IR	Installation Restoration
NPL	National Priorities List
NWIRP	Naval Weapons Industrial Reserve Plant
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
ORC	oxygen releasing compound
PA	Preliminary Assessment
PAH	polynuclear aromatic hydrocarbon
PRAP	Proposed Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
ROD	Record of Decision
SCDHS	Suffolk County Department of Health Services
SCGs	standards, criteria, and guidance
SI	Site Investigation
SVOC	semivolatile organic compound
UST	underground storage tank
VOC	volatile organic compound

TABLE 1

NATURE AND EXTENT OF SOIL CONTAMINATION
SITE 7 – FUEL DEPOT
NWIRP CALVERTON, NEW YORK

Chemical	Frequency of Detection	Range of Positive Detections	Frequency Exceeding SCGs/PRGs	SCG/PRG
Volatile Organics (µg/kg)				
Ethylbenzene	1/32	590	1/32	550
Methylene chloride	1/32	5.5	0/32	100
Toluene	3/32	4 – 10	0/32	150
Xylene	2/32	8.3 – 2,600	1/32	120
Semivolatile Organics (µg/kg)				
2-Methylnaphthalene	1/32	2,600	0/32	36,400
Acenaphthene	1/32	87	0/32	50,000
Anthracene	3/32	310 – 1,200	2/32	500
Benzo(a)anthracene	8/32	94 – 3,300	5/32	330
Benzo(a)pyrene	10/32	36 – 2,200	6/32	330
Benzo(b)fluoranthene	10/32	50 – 1,700	6/32	330
Benzo(g,h,i)perylene	9/32	190 – 1,100	6/32	330
Benzo(k)fluoranthene	8/32	57 – 1,700	4/32	330
Carbazole	1/32	120	NA	NA
Chrysene	8/32	82 – 3,100	6/32	330
Dibenzo(a,h)anthracene	1/32	240	0/32	330
Di-n-butyl phthalate	4/32	26 – 360	0/32	8,100
Di-n-octyl phthalate	1/32	30	0/32	50,000
Fluoranthene	8/32	130 – 7,400	0/32	50,000
Fluorene	2/32	180 – 550	0/32	50,000
Indeno(1,2,3-cd)pyrene	10/32	36 – 1,400	7/32	330
Phenanthrene	4/32	250 – 2,100	0/32	50,000
Pyrene	8/32	120 – 10,000	0/32	50,000

TABLE 2

NATURE AND EXTENT OF GROUNDWATER CONTAMINATION
SITE 7 – FUEL DEPOT
NWIRP CALVERTON, NEW YORK

Chemical	Maximum Concentration	SCG/PRG
Volatile Organics (µg/L)		
Benzene	17	1
Ethylbenzene	480	5
Freon	100	5
Toluene	710	5
Xylenes	2,400	5
Semivolatile Organics (µg/L)		
2-Methylnaphthalene	78	50
Naphthalene	150	10
Inorganics (µg/L)		
Lead	25	15/25[(1)]

1 Federal action level for potable water supplies is 15 µg/L; NYSDEC groundwater quality standard is 25 µg/L.

TABLE 3

REMEDIAL ALTERNATIVE COSTS
SITE 7 – FUEL DEPOT
NWIRP CALVERTON, NEW YORK

Remedial Alternative	Capital Costs	Annual O&M Costs	Annual Monitoring Costs	Total Present Worth
Alternative 1	$0	$0	$0	$0
Alternative 2	$70,300	$0	$220,000 (Year 1) $79,400 (Years 2 through 30)	$1,230,000
Alternative 3	$2,240,000	$150,000 (Years 1 through 30)	$116,000 (Year 1) $55,900 (Years 2 through 30)	$4,900,000
Alternative 4	$700,000	$59,400 (Years 1 through 4)	$78,000 (Year 1) $42,280 (Years 2 through 30)	$1,570,000
Alternative 5	$3,800,000	$0	$80,160 (Year 1) $55,000 (Years 2 through 30)	$4,500,000

5-year review costs of approximately $20,000 each are not shown but are included in the present worth.

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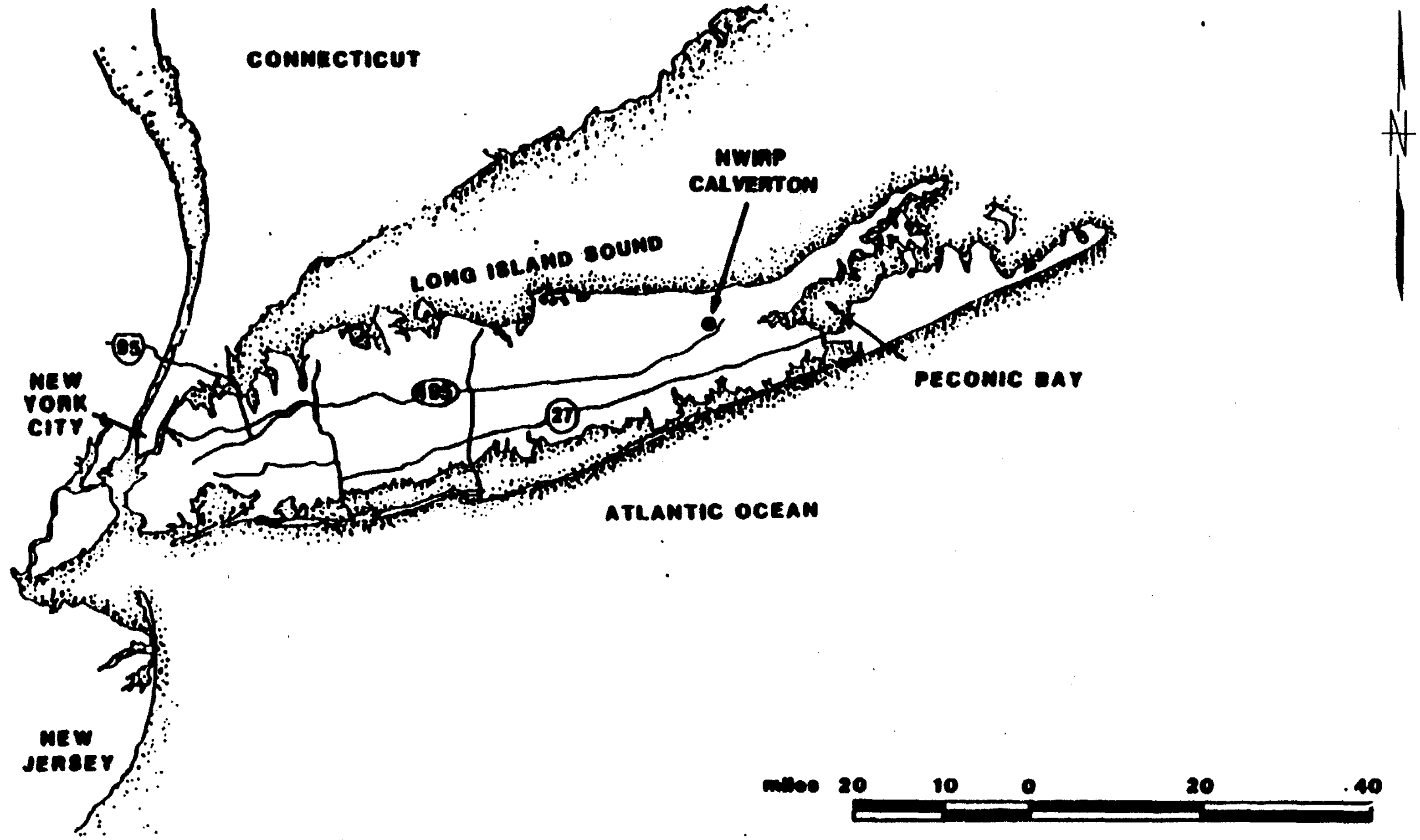

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CHECKED BY	DATE	GENERAL LOCATION MAP SITE 7 – FUEL DEPOT NWIRP, CALVERTON, NEW YORK	APPROVED BY	DATE	
COST/SCHED-AREA			APPROVED BY	DATE	
SCALE AS NOTED			DRAWING NO.	FIGURE 1	REV. 0

FORM CADD NO. TtNUS_AH.DWG - REV 0 - 1/22/98

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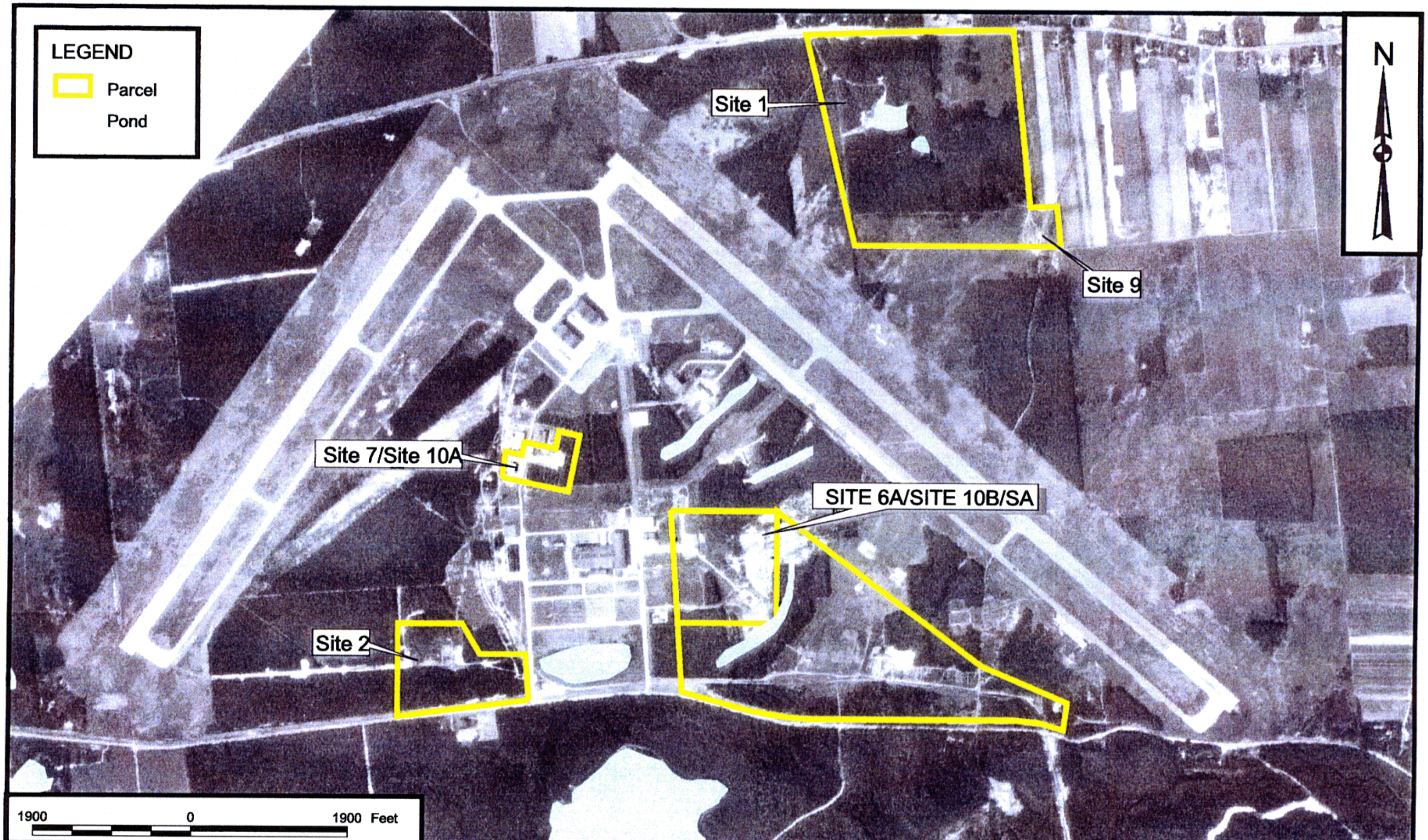

DRAWN BY J. LAMEY / DATE 11/22/99	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7398	OWNER NUMBER 0270
CHECKED BY / DATE	SITE LOCATION MAP NWIRP CALVERTON, NEW YORK	APPROVED BY / DATE	
COST/SCHEDULE-AREA		APPROVED BY / DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 2	REV 0

P:\GIS\NWIRP_CALVERTON\SURFACE_WATER_HYDROLOGY.APR SITE LOCATION MAP 01/04/01 JAL

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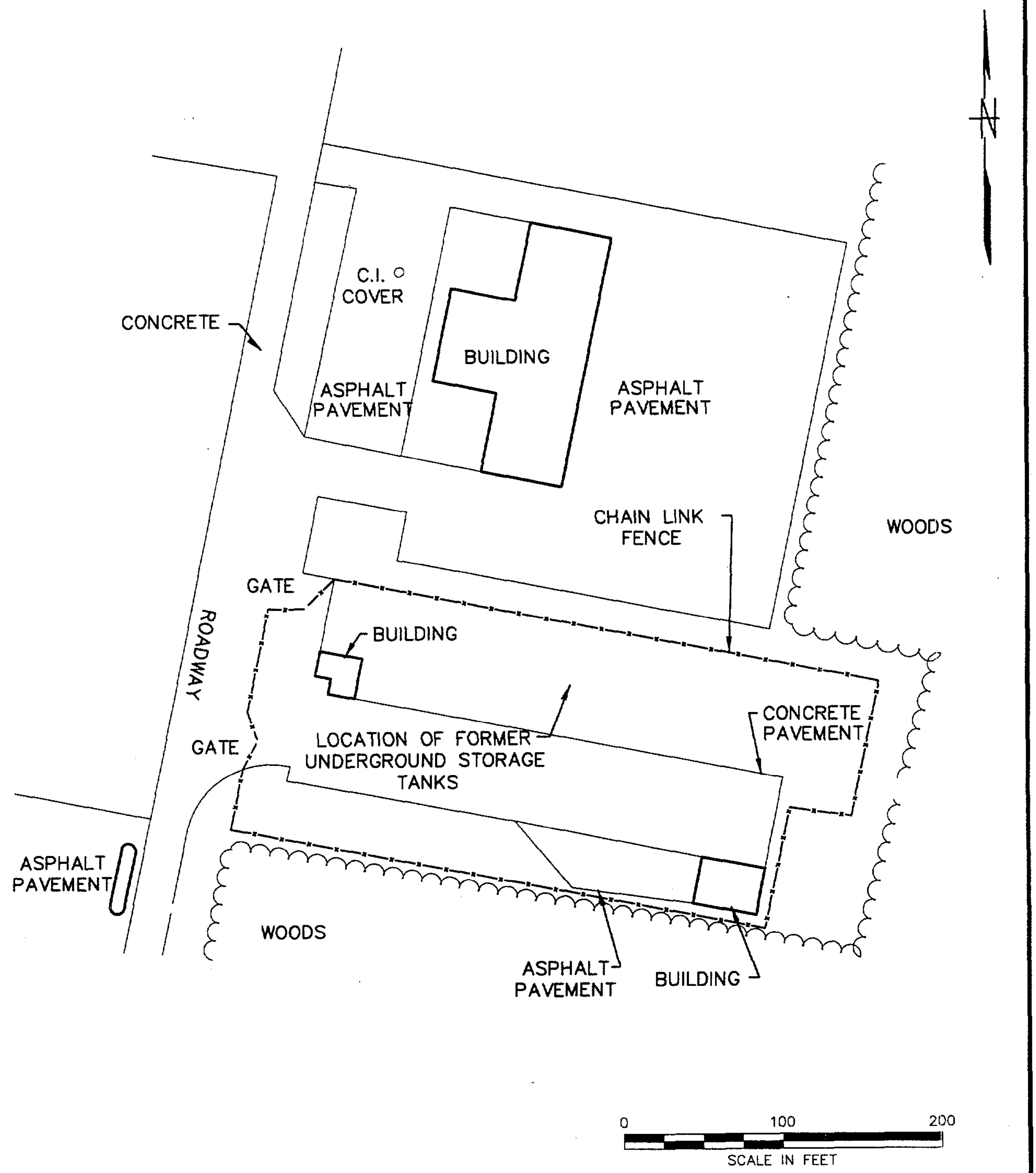

DRAWN BY HJP / DATE 9/12/01	Tetra Tech NUS, Inc.	CONTRACT NO. 4570	OWNER NO. 0189
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COST/SCHED-AREA		APPROVED BY / DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 3	REV. 0

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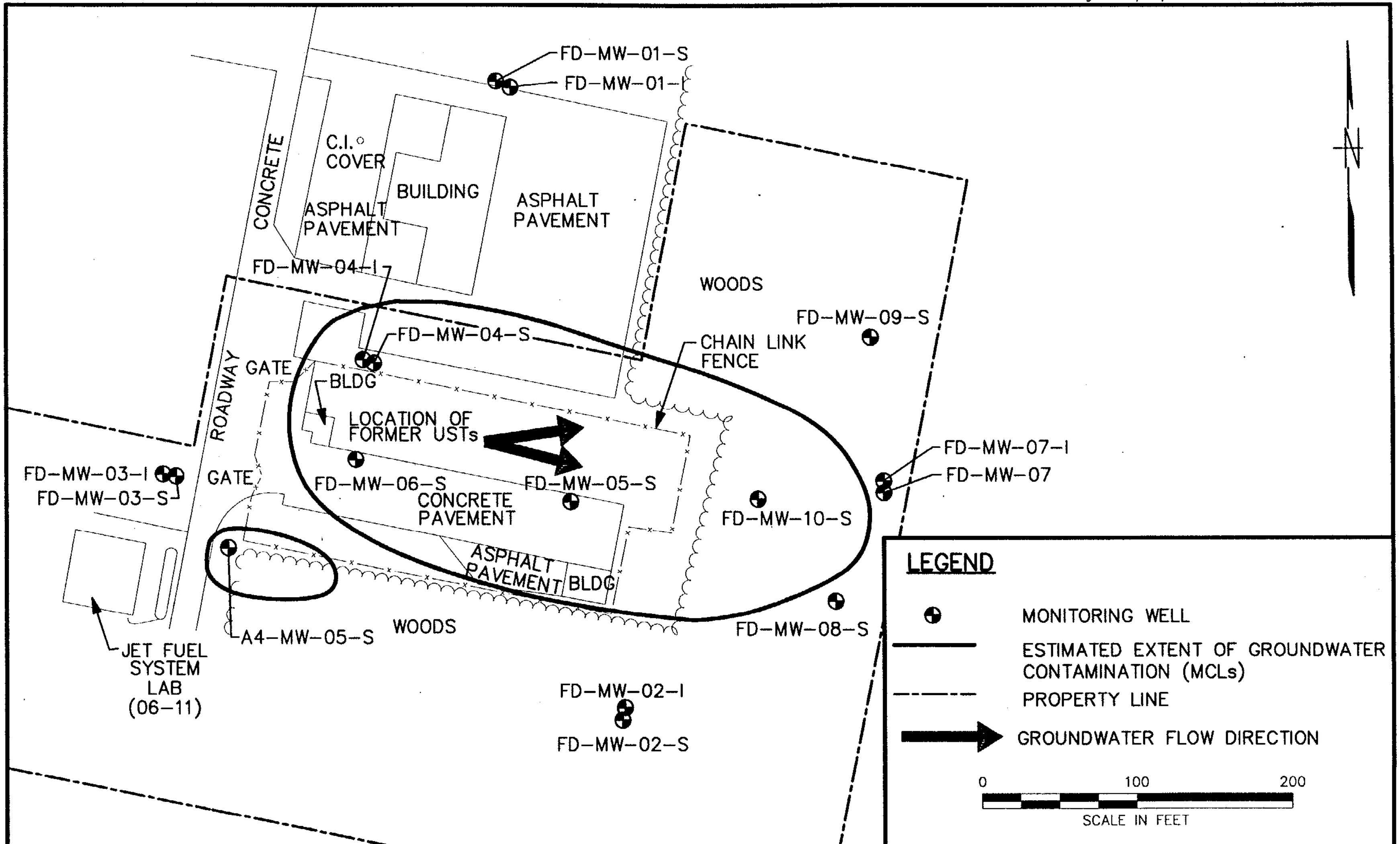

DRAWN BY HJP DATE 9/12/01	Tetra Tech NUS, Inc.	CONTRACT NO. 4570	OWNER NO. 0189
CHECKED BY DATE	ESTIMATED EXTENT OF GROUNDWATER CONTAMINATION SITE 7 – FUEL DEPOT NWIRP, CALVERTON, NY	APPROVED BY DATE	
COST/SCHED-AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 4	REV. 0

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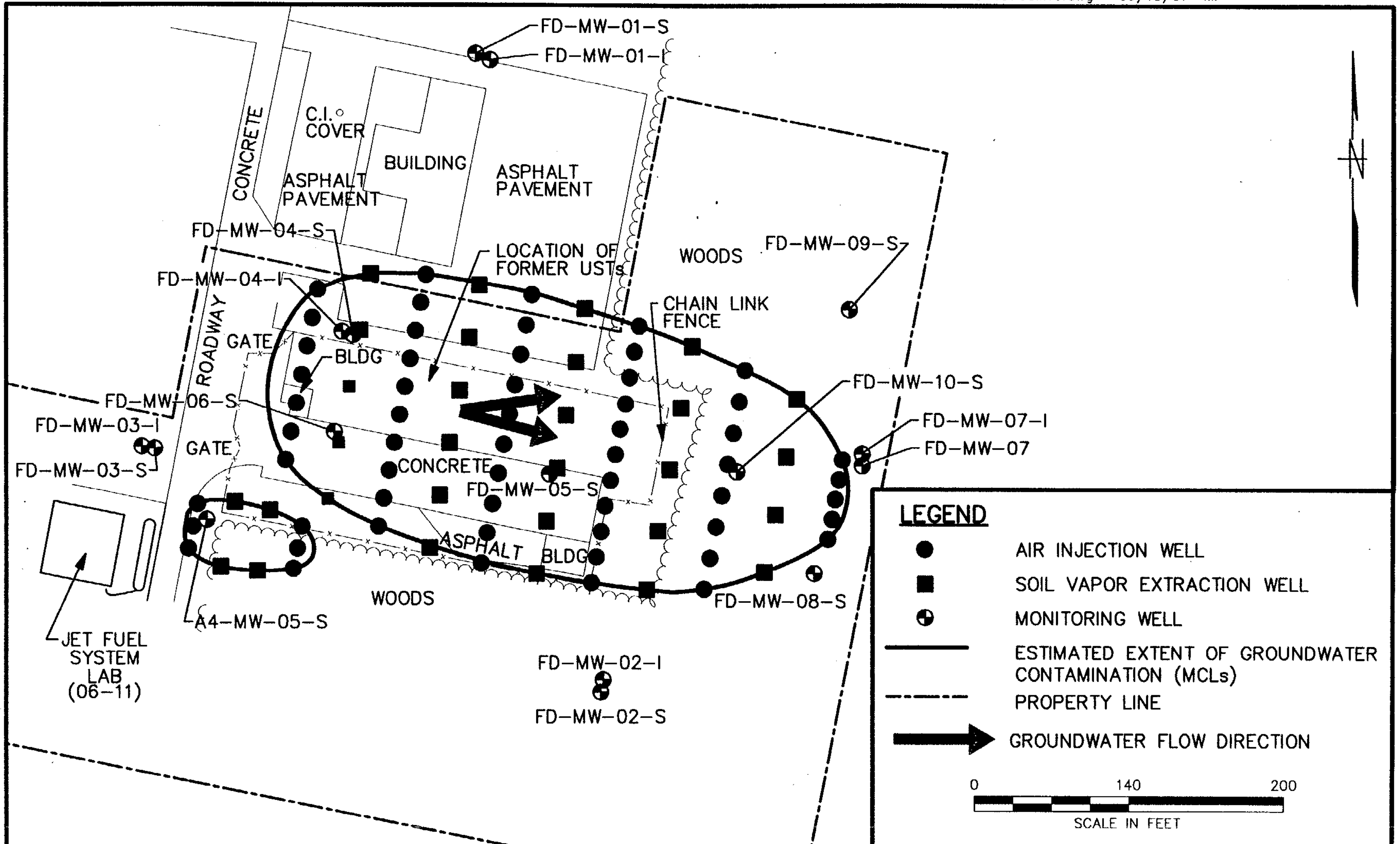

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CHECKED BY	DATE	**ALTERNATIVE 4: AIR SPARGING/BIOVENTING LAYOUT** **SITE 7 – FUEL DEPOT** **NWIRP, CALVERTON, NY**	APPROVED BY / DATE
COST/SCHED-AREA			APPROVED BY / DATE
SCALE AS NOTED			DRAWING NO. FIGURE 5 / REV. 0

FORM CADD NO. TtNUS_AH.DWG - REV 0 - 1/22/98

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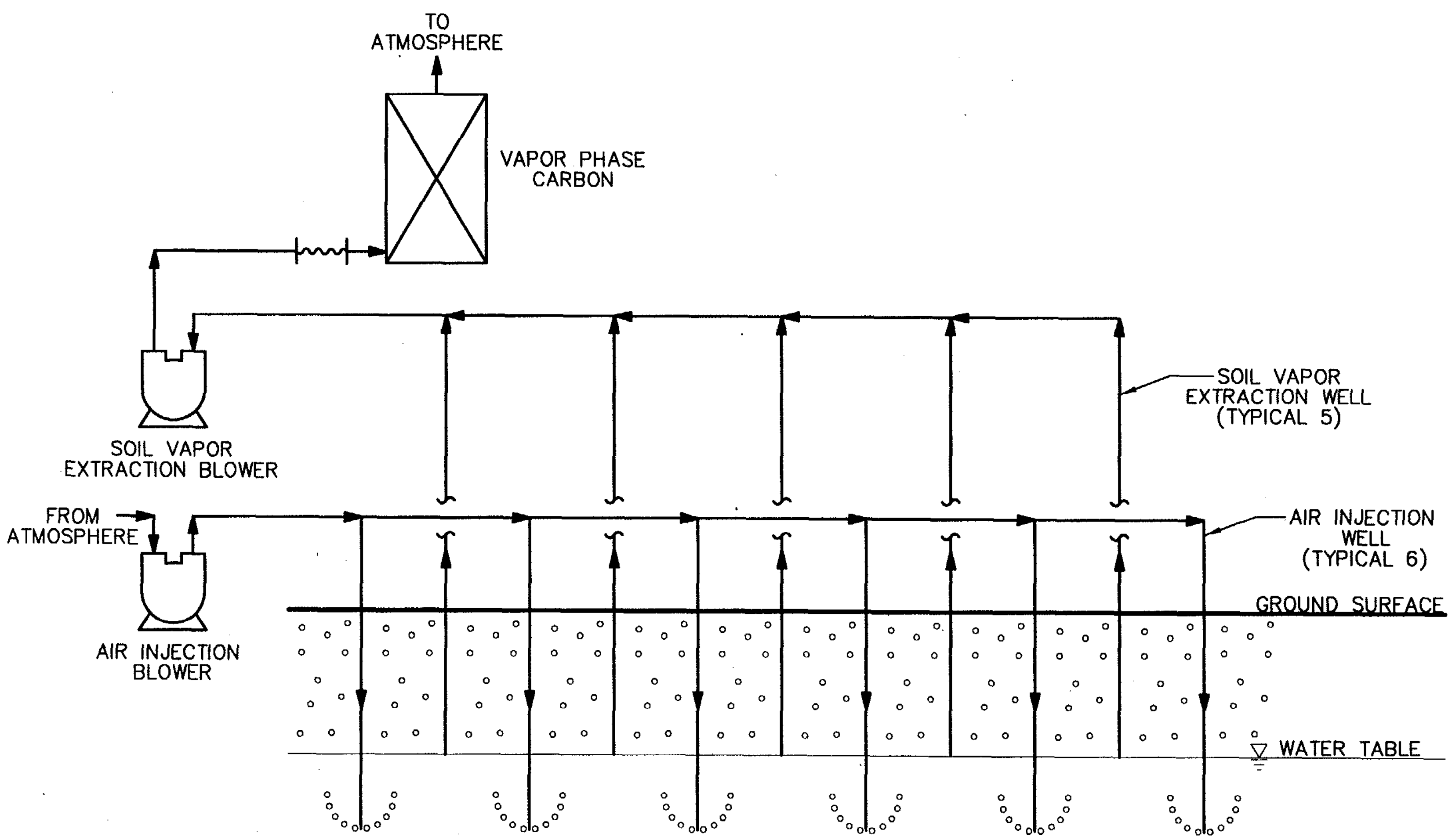

DRAWN BY MF / DATE 9/28/99	Tetra Tech NUS, Inc.	CONTRACT NO. 4570	OWNER NO. 0189
CHECKED BY / DATE	ALTERNATIVE 4 – AIR STRIPPING/BIOVENTING SCHEMATIC SITE 7 – FUEL DEPOT NWIRP, CALVERTON, NY	APPROVED BY / DATE	
COST/SCHED-AREA		APPROVED BY / DATE	
SCALE NOT TO SCALE		DRAWING NO. FIGURE 6	REV. 0

FORM CADD NO. TtNUS_AH.DWG - REV 0 - 1/22/98