FINAL

ENVIRONMENTAL CONDITION OF PROPERTY REPORT

MIDDLETOWN
U.S. ARMY RESERVE CENTER (CT005)
499 MILE LANE
MIDDLETOWN, CT 06457

Prepared For:

U.S. Army Corps of Engineers – Louisville District
Engineering Division – Environmental Engineering Branch
600 Dr. Martin Luther King, Jr. Place
Louisville, Kentucky 40202-2232

MARCH 2007

CERTIFICATION

All information/documentation provided accurately reflects the environmental condition of the property. This ECP Report is in general accordance with the U.S. Department of Defense (DoD) requirements for completion of an Environmental Condition of Property (ECP) Report.

GARY PURYEAR **DATE**
Environmental Division ARIM
Chief Environmental Division
94th Regional Readiness Command

The undersigned certifies the contents of this report are in general accordance with DoD policies for the completion of an ECP report.

LENARD GUNNELL, P.G. **DATE**
Project Geologist
U.S. Army Corps of Engineers

Executive Summary

CH2M HILL, under contract to the U.S. Army Corps of Engineers (USACE) Louisville District, prepared this Environmental Condition of Property (ECP) report for the Middletown U.S. Army Reserve (USAR) Center (Facility ID CT005), hereafter referred to as the "Property" or "USAR Center." The Property is located at 499 Mile Lane, Middlesex County, Middletown, Connecticut, 06457, and encompasses approximately 23.7 acres. This ECP Report was conducted in conformance with the Department of Defense's Base Redevelopment and Realignment Manual (BRRM), DoD 4165.77-M, Army Regulation 200-1, and the American Society for Testing and Materials (ASTM) Designation D6008-96 (2005), *Standard Practice for Conducting Environmental Baseline Surveys.*

This ECP Report details the history of the property, including the USAR and any prior tenant uses of the Property and the resulting environmental condition of the Property.

The USAR Center is on 23.7 acres of land and has one permanent structure (the Reserve Center building), one parking lot, and remnants of Nike missile operations, which include the foundations of the former Warhead Building, former Missile Testing and Assembly Building, and former barracks. A fenced area contains three closed, underground missile silos. As of September 2006 the Property is not occupied. Based on a review of aerial photographs and U.S. Geological Survey topographical maps, the area immediately surrounding the Property is and has been undeveloped, with the exception of a housing development located east of the Property. The facility originally was constructed between 1956 and 1958 as a Nike Missile Launch facility. The current Reserve Center building was constructed in 1987, and the original Nike Missile facility structures on the Property were demolished in the late 1990s.

Areas of potential environmental concern were reviewed and CH2M HILL identified the following related to the environmental condition of the Property: historic fuel oil releases from underground storage tanks; reported onsite disposal of "potentially polluting materials"; a reported fuel oil spill from a transfer line; potential historical releases from an oil/water separator; the presence of volatile organic compounds (VOCs) and petroleum hydrocarbons in the groundwater; historical application of chlordane to building foundations; possible use of petroleum products as dust control; and potential releases from a former septic system/drain tile field.

In accordance with Department of Defense policy defining the classifications (see Sherri Goodman Memorandum dated 21 October 1996), the Property has been classified as Type 7. This classification does not include categorizing the property based on *de minimis* conditions that generally do not present material risk of harm to the public health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies.

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Abbreviations and Acronyms

ACM	asbestos-containing material
AMSA	Area Maintenance Support Activity
amsl	above mean sea level
AOC	area of concern
AR	army regulation
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
bgs	below ground surface
BRAC	Base Realignment and Closure
BRRM	Base Redevelopment and Realignment Manual
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	CERCLA Information System
CFR	Code of Federal Regulations
CORRACTS	Corrective Action Report
CTDEP	Connecticut Department of Environmental Protection
1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
cis-1,2-DCE	cis-1,2-dichloroethene
DEC	Direct Exposure Criteria
DEP	Department of Environmental Protection
DoD	Department of Defense
DTC	Diversified Technology Consultants
EBS	Environmental Baseline Study
ECP	environmental condition of property
EDR	Environmental Data Resources, Inc.
EPH	extractable petroleum hydrocarbon
ERNS	Emergency Response Notification System
ETPH	extractable total petroleum hydrocarbons

FEMA	Federal Emergency Management Agency
IRFNA	inhibited red-fuming nitric acid
kg	kilogram
LBP	lead-based paint
LUST	leaking underground storage tank
MEC	munitions and explosives of concern
MEP	military equipment parking
msl	mean sea level
NEPA	National Environmental Policy Act
NPL	National Priorities List
OLISP	Office of Long Island Sound Program
OMS	organizational maintenance shop
OWS	oil/water separator
PCB	polychlorinated biphenyl
pCi/L	picoCuries per liter of air
POL	petroleum, oil, and lubricant
PPM	potentially polluting materials
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
RCRIS	RCRA Information System
RRC	Regional Readiness Command
RSC	Regional Support Command
RSR	Remediation Standard Regulations
SHWS	State Hazardous Waste Site
SVOCs	semivolatile organic compounds
SWP3	Storm Water Pollution Prevention Plan
TCA	1,1,1-trichloroethane
TCE	trichloroethylene
TCLP	toxicity characteristic leaching procedure
TPH	total petroleum hydrocarbons
TSD	treatment, storage, or disposal

UDMH	unsymmetrical dimethylhydrazine
USACE	U.S. Army Corps of Engineers
USAR	U.S. Army Reserve
USC	U.S. Code
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
VOCs	volatile organic compounds
VPH	volatile petroleum hydrocarbon

1 Introduction

CH2M HILL, under contract to the U.S. Army Corps of Engineers (USACE) Louisville District, was authorized to conduct an Environmental Condition of Property (ECP) report for the Middletown U.S. Army Reserve (USAR) Center (CT005), in response to the Base Realignment and Closure (BRAC) 2005 legislation. The facility is located at 499 Mile Lane, Middlesex County, Middletown, Connecticut, and is hereafter referred to as the Property or USAR Center. CH2M HILL prepared this ECP report under contract number W912QR-04-D-0020, Task Order No. 0018, with the Louisville District USACE.

A visual non-intrusive reconnaissance of the Property was conducted on August 22, 2006, in support of the ECP. The reconnaissance purpose was to obtain visual information indicating the likelihood of recognized environmental conditions associated with the Property or adjacent properties.

In preparing this ECP report, CH2M HILL gathered information from the available records and previous work from others; interviews with individuals purporting to be familiar with the Property; and observations from a site reconnaissance. The accuracy of the information obtained from these sources was not verified by CH2M HILL. As such, CH2M HILL will make no warranty, expressed or implied, relative to the accuracy, completeness, or reliability of the information used to create the records and reports prepared by others.

1.1 Purpose of Environmental Condition of Property

The Military Department with real property accountability shall assess, determine, and document the environmental condition of all transferable property in an ECP Report. This ECP Report is based on readily available information. Pursuant to the Department of Defense's (DoD) policy, set forth in the Base Redevelopment and Realignment Manual (BRRM) (DoD 4165.66-M, March 1, 2006) Section C8.3, the primary purposes of the ECP Report include the following:

- Provide the Army with information it may use to make disposal decisions.
- Provide the public with information relative to the environmental condition of the Property.
- Assist in community planning for the reuse of BRAC property.
- Assist federal agencies during the property screening process.
- Provide information for prospective buyers.
- Assist prospective new owners in meeting the requirements under U.S. Environmental Protection Agency's (USEPA) "All Appropriate Inquiry" regulations.
- Provide information about completed remedial and corrective actions at the property.

- Assist in determining appropriate responsibilities, asset valuation, and liabilities with other parties to a transaction.

The ECP Report contains the information required to comply with the provisions of 40 Code of Federal Regulations (CFR) Part 373, which require that a notice accompany contracts for the sale of, and deeds entered into, for the transfer of federal property on which any hazardous substance was stored, released, or disposed of. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Section 120(h) stipulates that a notice is required if certain quantities of designated hazardous substances have been stored on the property for 1 year or more—specifically, quantities exceeding 1,000 kilograms (kg) or the reportable quantity, whichever is greater, of the substances specified in 40 CFR 302.4 or 1 kg of acutely hazardous waste as defined in 40 CFR 261.30. A notice is also required if hazardous substances have been disposed of or released on the property in an amount greater than or equal to the reportable quantity. Army Regulation (AR) 200-1 requires that the ECP Report address asbestos, lead-based paint (LBP), radon, and other substances potentially hazardous to human health.

This ECP Report used the American Society for Testing and Materials (ASTM) Designation D6008-96 (2005), *Standard Practice for Conducting Environmental Baseline Surveys*, the BRRM, CERCLA § 120, and AR 200-1.

1.2 Scope of Services

This ECP report covers the 23.7-acre USAR Center located at 499 Mile Lane, Middletown, Connecticut. The Property is located in a rural area and is surrounded by undeveloped property. All site maps, figures, and aerial photographs referenced herein are provided in Appendix A, while Appendix B contains the photographs taken during the August 22, 2006, site reconnaissance. Appendix C contains the Property chain of title information. Relevant historical environmental documents and reports are provided in Appendix D, while Appendix E contains the Environmental Data Resources, Inc. (EDR) radius search reports commissioned for this effort.

This ECP report classifies the property into one of seven DoD Environmental ECP categories in accordance with DoD policy defining the classifications (see Sherri Goodman Memorandum dated 21 October 1996).. The property classification categories are as follows:

- ECP Area Type 1—An area or parcel of real property where no release or disposal of hazardous substances or petroleum products or their derivatives has occurred (including no migration of these substances from adjacent properties).

- ECP Area Type 2—An area or parcel of real property where only the release or disposal of petroleum products or their derivatives has occurred.

- ECP Area Type 3—An area or parcel of real property where release, disposal, or migration, or some combination thereof, of hazardous substances has occurred, but at concentrations that do not require a removal or remedial action.

- ECP Area Type 4—An area or parcel of real property where release, disposal, or migration, or some combination thereof, of hazardous substances has occurred and all remedial actions necessary to protect human health and the environment have been taken.

- ECP Area Type 5—An area or parcel of real property where release, disposal, or migration, or some combination thereof, of hazardous substances has occurred and removal or remedial actions, or both, are underway, but all required actions have not yet been taken.
- ECP Area Type 6—An area or parcel of real property where release, disposal, or migration, or some combination thereof, of hazardous substances has occurred, but required response actions have not yet been initiated.
- ECP Area Type 7—An area or parcel of real property that is unevaluated or requires additional evaluation.

2 Site Location and Physical Description

2.1 Site Location

The USAR Center is located at 499 Mile Lane, Middletown, Connecticut. The 23.7-acre Property is located in a rural area and is surrounded by undeveloped property. A housing development is located east of the Property on the south side of Mile Lane.

2.2 Asset Information

Facility Name and Address:	Middletown U.S. Army Reserve Center 499 Mile Lane Middletown, Connecticut
Property Owner:	U.S. Government
Date of Ownership:	September 22, 1955
Current Occupants:	Property vacated as of September 15, 2006
Zoning:	Residential
County, State:	Middlesex, Connecticut
U.S. Geological Survey (USGS) Quadrangle(s):	Middletown
Latitude/longitude:	41° 34′ 54.8″N; 72° 41′ 33.4″W

Legal Description:

The deed for this property specifies the Property as "Volume 269, Page 132, Tract No. A-106, Volume 269, Page 133, Tract No. A-106B, and Volume 269, Page 134, Tract No. A-107."

2.3 Physical Description

The USAR Center is located on a 23.7-acre parcel in the Middletown, Connecticut, and contains one permanent structure (the Reserve Center), one paved parking lot, and the foundations of three demolished buildings. These were foundations of buildings associated with a Nike missile battery previously located on the Property, including a former barracks, the Warhead Building (later used as a storage garage), and the Missile Test and Assembly Building (later used as a maintenance shop). There were formerly 2 additional buildings on the property that served as sentry stations/guardhouses, as well as 3 underground missile silos. These buildings were demolished sometime after 1998. Additional paved parking areas historically occurred on the property, just behind the current Reserve Center and just north of the former barracks building. Military vehicles also were parked historically in an unpaved area near the former Nike missile silos. A location map is included as Figure 1 in Appendix A. A site layout plan is included as Figure 2 in Appendix A.

Construction of the current Reserve Center was completed in 1987. The building is an irregular-shaped, multiple-level structure, with a two-story drill hall. The building's interior is two levels in certain areas and consists of office space, classrooms, storage, a drill hall, and a kitchen area, which has not been in use for years. The main entrance is located on the north side of the facility and the entrance is secured.

The southern part of the property currently is wooded heavily. On the northern edge of the woods, near the rear of the Reserve Center, are two building foundations from the former Nike Warhead and Nike Missile and Test Assembly buildings. There is a wash rack with an oil/water separator (OWS), located approximately 25 feet north of the former Missile Test and Assembly building.

On the southeast corner of the facility is a fenced area that has sparse ground covering. The fenced area was the former location of the launch pads and silos for the Nike missile operations at the Property. The silos were reportedly pumped dry and filled with a sand slurry and debris from the walls of the silos in 1988.

The third foundation, formerly the barracks for personnel that supported the Nike missile operations, is located centrally on the property, just north of the Reserve Center. The building was converted for use as a Reserve Center until the current building was constructed in 1987. An undated aerial photo (Figure 3, Appendix A) found at the Property shows the Nike missile site when it was in operation.

On the northern portion of the property, approximately 300 feet of railroad track was built as part of reserve unit training. There are a several stacks of creosote-treated rail timbers on the facility and some scattered in the wooded area on the south side of the property.

Also on the north side of the property, remnants of the old septic system and leach bed are still in place underground, according to site interviews. The location and condition of the system is unknown.

Fourteen groundwater-monitoring wells are located on the Property, installed as part of various environmental site investigations described in the remainder of this report.

Topographically, the Property has an elevation difference of approximately 100 feet, and has been separated into four distinct step-like terraces. The lowest terrace borders Mile Lane and contains the section of railroad used for training and the abandoned leach bed/septic system. The second terrace contains the foundation of the former barracks building/Reserve Center. The third terrace is the Property of the current Reserve Center and the parking area. The highest terrace contains the foundations of the former Missile and Test Assembly (also known as the maintenance shop) and Warhead (also known as the garage) buildings, along with the former launch pad area/missile silos.

2.4 Site Hydrology and Geology

The USAR Center lies within the Connecticut Valley Lowland region of the New England physiographic province. The USAR Center lies within the South Central Lowlands

Ecoregion. The present topography observed in the vicinity of the Property is the direct result of glacial deposition and erosion related to the distribution of underlying bedrock masses and changing water levels of glacial Lake Hitchcock (CT Facilities Date Unknown). Topographic maps indicate that the Property has a total relief of approximately 100 feet. The Property lies between approximately 50 and 150 feet above mean sea level (amsl).

The bedrock formation underlying the Property has been described as belonging to the Portland Arkose Formation of Triassic age. This formation has been described to consist of gray-red to red-brown and pale brown, coarse to fine, arkose with interbedded arkose conglomerate, red and gray shale, mudstone, and gray-green feldspathic sandstone underlying the Portland Arkose dense gray to gray-green Hampden basalt. The surficial geology is composed of thin till in the southern portion of the Property and fine deposits at the north-northeastern portion of the Property. The till deposits are generally less than 10 to 15 feet thick and are loose to moderately compact, generally sandy and commonly stony. The fine deposits are composed of well-sorted, thing layers of alternating silt and clay, or thicker layers of very fine sand and silt (U.S. Army Environmental Hygiene Agency, 1992; Kemron, 2006**).**

2.4.1 Surface Water Characteristics

Figure 4 in Appendix A provides a portion of the 1965 Middletown, Connecticut, USGS topographic map that includes the Property. As shown, the Property is situated on an elevation that slopes from 150 feet amsl in the south to about 50 feet mean sea level (msl) in the north.

The Property lies within central Connecticut, in the floodplain of the Connecticut River Valley, which is bordered by upland of moderate to rugged relief. The closest surface water features to the Property are two brooks—the West Swamp Brook, located approximately 660 feet to the west of the Property, and the East Swamp Brook, located approximately 0.5 mile to the east of the Property. Both brooks feed into the Mattabesset River (CT Project Facilities, date unknown). An intermittent stream is located near the southeast boundary of the Property and on the adjacent property to the east.

The Stormwater Pollution Prevention Plan (SWP3) prepared for this Property (USGS, 1999) identified six storm drains by which stormwater runoff leaves the Property. Stormwater runoff from the Property also flows directly into grassy areas or riprapped drainage swales. The storm drains direct flow through 1-foot corrugated metal or plastic pipes with flared exit openings, into riprapped dry wells from where the stormwater infiltrates into the ground.

2.4.2 Hydrogeological Characteristics

According to information acquired from the U.S. Department of Agriculture (USDA), soils in the Property area are described as consisting of Udonrthents-Urban Land complex. This soil complex is described as areas that have been disturbed by cutting or filling and have had more than 2 feet of the upper part of the original soil removed or have been covered with more than 2 feet of fill material. These well-drained soils are found on the sides of drumlins and in glacial till uplands 8 to 15 percent on slope.

Groundwater beneath the Property is classified by the Connecticut Department of Environmental Protection (CTDEP) as "GA" quality, meaning that it is within the area of influence of existing private water supply wells or groundwater with potential to provide water to public or private water supply wells, and which is potable without treatment. Depth to groundwater is between 4 and 30 feet below ground surface (bgs). The direction of groundwater flow on the Property can vary. Groundwater in the area of the former Nike missile silos is east-northeast, discharging to West Swamp Brook, while groundwater flow on the southern side of the Property is predominantly to the north-northeast (Clean Harbors Environmental Engineering, 1990; Kemron, 2006).

2.5 Site Utilities

Water Service – The City of Middletown provides potable water service to the Property.

Sanitary Sewer System – The City of Middletown currently provides sanitary sewer service to the Property. The primary source of wastewater that is directed to the city sewer system includes non-process wastewater (bathrooms, sinks, etc.) There is a leach bed/septic system on the property that historically was used to discharge sanitary wastes.

Gas and Electric—Yankee Gas provides natural gas service to the Property, while Northeast Utilities provides electric service to the Property.

2.6 Water Supply Wells and Septic Systems

Interviews with site personnel indicate that a water supply well may have been located on the Property, however, there is currently no evidence of this well and its location is unknown. Site personnel also stated that an old septic system and leach bed are located on the north end of the Property, which historically were used for the disposal of sanitary waste.

3 Site History

3.1 History of Ownership

The U.S. Government purchased the USAR Center Property in September 1955. Two parcels (Tract No. A-106 and Tract No. A-106B) were purchased from Irving Sherman and a third (Tract No. A-107) was purchased from Paul Gilbert. The chain of title information was obtained from the Environmental Baseline Study (EBS), which was prepared by the 94th Regional Support Command (RSC) in November 1998. A copy of the chain of title is provided in Appendix C.

According to a city directory provided by EDR and dated June 24, 2006, the address of the USAR Center was not listed in the research source (Polk's City Directory and Robinson's City Directory). Subsequent city directory searches also do not list the Property. Historical documentation supports the original construction of the Nike missile battery in the late 1950s and the Reserve Center in 1987. The results of the city directory search are included in Appendix E.

3.2 Past Uses and Operations

The facility originally was constructed between 1956 and 1958 as a Nike Missile Launch facility (Nike surface-to-air missile battery HA-48), one of six missile launch sites constructed in the mid-1950s for the Army's Hartford Defense Area. The Middletown Nike battery was one of two Hartford Defense Area sites retained in the early 1960s for the Nike-Hercules missiles, which were armed with tactical nuclear warheads. Both Ajax and Hercules missiles were deployed at Nike missile battery HA-48 (USACE, 2003). The Nike air defense mission was taken over by the Connecticut National Guard in 1964. The Middletown Nike facility was decommissioned in 1968, and the property was transferred to the USAR in 1970. The 1205th transportation railway operating battalion occupied the Property until 2006, using it primarily for administrative purposes. The USAR used the existing Nike barracks and the Administration Building on the Property until 1987, when the new USAR Center was completed. The original structures on the Property were used for storage and office space until they were demolished in the late 1990s.

The Nike Missile Launch Facility consisted of buildings and equipment required to assemble, test, and maintain the Hercules missiles and associated launchers. Structures for the Launch Area included a barracks, a Missile Assembly and Test Building, a Warhead Building (including an acid fueling pad and pit), three missile silos, a septic tank and associated drainage field, and guard houses. The missile silos would have contained four launchers each, with a storage magazine for 30 missiles.

The Warhead Building was used to fuel the missiles and to store and assemble the explosive components of the missiles. The Warhead Building would have contained an acid fueling pad and pit. The USAR used the former Warhead Building as a garage for storage. The Missile Assembly and Test Building was used to conduct initial missile assembly and test operations. Missiles arrived in major assembly components unassembled and unarmed. The assembly consisted of the installation of the missile fins, ailerons or elevons, and missile body sections and system tests. The USAR converted this building to a maintenance shop. Historical reports indicate that the "maintenance shop" was used to check fluid levels and component operation, and that vehicle maintenance was performed at the organizational maintenance shop (OMS) in West Hartford, Connecticut, or at the Area Maintenance Support Activity (AMSA) shop in Windsor Locks, Connecticut. There is also a wash rack and OWS located approximately 25 feet from the Missile Assembly and Test Building.

Topographic maps (dated 1965, 1972, 1984, and 1992) and historical aerial photographs (date unknown, 1989, and 1995) were a source of information on the past use and operations at the Property. Figures 3-9 in Appendix A provide USGS topographical maps and aerial views of the Property and surrounding areas.

The 1965, 1972, and 1984 USGS topographic maps (4, 5, and 6 of Appendix A) show the establishment of the location of the U.S. Military Reserve in a rural area. The Environmental Baseline Survey (Diversified Technology Consultants [DTC], 1998) states that the Property was farmland prior to development as a Nike Missile site in 1955. These maps indicate that the elevation of the Property and surrounding areas varies significantly, even within the Property. The figures also identify a housing development to the east of the Property. The 1992 topographic map (Figure 7, Appendix A) shows that the area has remained relatively unchanged from the mid-1960s and the notation of the U.S. Military Reserve has been removed.

An undated aerial photograph (Figure 3, Appendix A) shows the development of the Property and the locations of three Nike missile silos and launch pads, the barracks, the Warhead Building, the Missile Testing and Assembly Building, dog kennels, and the guard shacks. The entire property has been cleared of trees and shrubs. The 1989 aerial photo (Figure 8, Appendix A) was of poor quality, but the original structures and the new USAR Center can be seen on the Property along with the residential area to the east. The 1995 aerial photo (Figure 9, Appendix A) shows that the Property remained relatively unchanged from the 1989 photograph.

3.3 Past Use, Storage, Disposal, and Release of Hazardous Substances

3.3.1 Past Use and Storage of Hazardous Substances

Information related to the past use and storage of hazardous substances for USAR activities at the Property was compiled through review of reasonably available records, search of federal and state environmental databases, and interviews with USAR personnel. Prior to its closure in September 2006 janitorial chemicals and building maintenance-related products were stored in the designated storage area within the janitorial closet located in the Reserve Center.

Historical records also indicate that certain types of chemical products used and stored at the Property would have contained hazardous substances pursuant to CERCLA 101(14) (42 U.S. Code [USC] 9601(14)).

A SWP3, prepared in 1999, identifies the disposal of potentially polluting materials (PPM) behind the "control building" (also known as the former Warhead Building or Garage) and potential leaks from military vehicles parked in an unpaved area. PPMs include any hazardous material that could come in contact with precipitation or stormwater runoff. While the report did not include a hazardous material inventory, it did note that a pool of petroleum, oil, and lubricants (POLs) was present within the secondary containment berm of the POL shed and that discarded aerosol paint cans, some quart and gallon size paint cans, and a half-empty 1-gallon can of wood cleaner were present in an unused flammable materials storage cabinet located in the paved area behind the control building.

While no vehicle maintenance was reportedly performed at the Property during the USAR's tenure, three 55-gallon drums of unknown content were observed in a historical photograph taken prior to 1996 from outside of the former Missile Test and Assembly Building (also known as maintenance building). Two of the drums were on secondary containment pallets in the photograph. The drums were not present during a 1996 site visit. Additionally, a flammable materials cabinet, located just west of the northwest corner of the former Warhead Building, contained 3 one-gallon pain cans; 4 quart-sized paint cans; 8 aerosol paint cans; and 2 one-gallon cans of paint thinner. No staining or evidence of a release was observed on the ground near this storage cabinet, and the cans were all in fair to good condition in 1996 (DTC, 1998).

Several historical reports have been prepared to assess the potential environmental concerns associated with Nike Missile sites. Some of these reports were reviewed to assess potential sources of contamination at the Middletown Nike battery. The following general Nike missile operations and list of possible hazardous substances associated with the launch areas were developed from the documents:

Missiles arrived at the Nike batteries unassembled and unarmed. The missiles were assembled in the Missile Assembly and Test Building. Assembly consisted of installing missile fins, ailerons, and missile body sections. Missile systems tests also were performed in this building. Small quantities of solvents, lubricants, and paint and petroleum distillates commonly were used in the missile assembly/disassembly process.

Ajax missiles were fueled at the acid fueling pad with inhibited red-fuming nitric acid (IRFNA) and unsymmetrical dimethylhydrazine (UDMH) on the acid fueling pad. Drums of each compound were stored in the vicinity of the acid fueling pad. Due to the high reactivity of both compounds, strict protocol was followed for the handling of these materials. If a spill of these materials did occur, the IRFNA was neutralized with sodium bicarbonate and the UDMH was neutralized with acetic acid. Due to their high reactivity, IRFNA and UDMH do not typically persist in the environment. Minimal quantities of solvents and lubricants typically were used in the Warhead Building. Hercules used only solid propellant rocket motors (that is, M30 sustainer and M42 booster) for propulsion.

Typically each Nike battery contained three silos. Missiles fueled and ready for firing were stored below ground in the missile silo magazines. The missile silos contained a small rail system used to deliver the missiles to the elevator and launcher. Up to 8 fully loaded missiles could be stored in a silo. The rail system, elevators, and launchers were hydraulically operated. A sump was located in the bottom of each silo to collect hydraulic fluid or other materials used during general maintenance of the hydraulic system and missiles. Solvents, paints, and hydraulic fluids typically were used and stored within the missile silos. These materials typically were washed into the sump which then discharged to the surface though a drainage tile. Drainage tile fields located on Nike batteries potentially may have accumulated hazardous materials. Floor drains located in operations buildings potentially were connected to the drainage tile system. Historically, drainage tile fields potentially accumulate unauthorized disposal of hazardous materials down floor drains, sinks and other facilities connected to the drainage system (Law Engineering, 1996; USACE, 2003; Law Environmental, Date Unknown).

During the site interviews, facility personnel noted the historical application of chlordane under the foundations of the demolished Nike missile buildings. As such, pesticides and herbicides likely were stored and used at the facility, although more detailed information was not available at the time of this report preparation.

3.3.2 Past Disposal and Release of Hazardous Substances

Information related to past disposal and potential release of hazardous substances at the Property was compiled through review of reasonably available records, search of federal and state environmental databases, and interviews with Army Reserve personnel. According to Army Reserve personnel and site records, onsite disposal of hazardous materials or wastes has not occurred at the Property while the property was used by the USAR.

The EBS indicates that the Property is listed with the State of Connecticut as "being suspect regarding the release of solvents, oils, and polychlorinated biphenyls (e) to the ground." The only spill reported with the State of Connecticut, on the Property, however, was a Number 2 fuel oil spill that was reported 1992 from a transfer line, which impacted groundwater.

As discussed in Sections 3.2 and 3.3.1, historical Nike Missile system reports indicate that hazardous substances were used at Nike missile sites including PCBs, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), POLs, and fuels. While site-specific information regarding the types and quantities of these hazardous substances was not reasonably available for the Property, several site investigations identified hazardous substance and petroleum releases to soil and groundwater, likely as a result of the historical Nike Missile battery operations. Contamination was identified during the following five investigations:

- Letter Report—Limited Subsurface Investigation, USAR Center, Mile Lane, Middletown, Connecticut, by Clean Harbors Environmental Engineering, December 7, 1990
- Technical Report—underground storage tank (UST) closure by ATEC Associates, March 1994
- UST Closure Report—UST removals at USAR Centers in Brocton and Springfield, Massachusetts, and Middletown, Connecticut, by Roy F. Weston, January 30, 1997
- EBS—Middletown USAR Center, by Diversified Technology Consultants, November 1998

- Draft Groundwater Monitoring Report—94th Regional Readiness Command (RRC) USAR Center, Middletown, Connecticut, by Kemron Environmental Services, August 1, 2006

During a limited subsurface investigation conducted of a 2,000-gallon UST by Clean Harbors in 1990, 1,1,1-trichloroethane (TCA), 1,1-dichloroethene (1,1-DCE), and 1,1-dichloroethane (1,1-DCA) were detected in the groundwater. However, it was subsequently determined that this contamination was not associated with the UST. Further investigation, performed during a Geohydrologic Study by the U.S. Army Environmental Hygiene Agency in 1992, detected carbon tetrachloride, trichloroethylene (TCE), and associated degradation products at levels exceeding the Primary Drinking Water Standards in three monitoring wells located near the center of the Property. It was suspected that these products came from a spill near the maintenance shop (also known as former Missile Assembly and Test Building). During the Geohydrologic Study, total petroleum hydrocarbons (TPH) were detected in several of the surface soil samples, but only one exceeded the regulatory limits. The study concludes that petroleum products likely were used to control dust at the Property, and that the TPH detected in surface soil samples did not appear to present a threat to the groundwater.

A third investigation conducted by Kemron in August 2005 and February 2006 reported that metals were detected in groundwater, but at levels below the applicable Remediation Standard Regulations (RSR) criteria. Cis-1,2-dichloroethene (cis-1,2-DCE) and toluene were detected in groundwater at concentrations below the applicable RSR criteria. Carbon tetrachloride, chloroform, and TCE were detected, but only TCE exceeded the applicable RSR criteria. No site-related SVOCs were detected in any of the groundwater samples. TPH was detected in one well, but at a concentration below the applicable RSR criteria.

3.4 Past Presence of Bulk Petroleum Storage Tanks

Based upon a review of reasonably available records, a search of federal and state environmental databases, interviews with USAR personnel, and a site reconnaissance, no aboveground storage tanks (AST) are currently or historically have been located on the Property. Four USTs containing No. 2 heating oil (a 2,000-gallon steel UST, a 550-gallon steel UST, a 550-gallon fiberglass UST, and a 2,500-gallon steel UST) previously were located at this facility, but have been removed.

Clean Harbors Environmental Engineering removed two No. 2 heating oil USTs (a 2,000-gallon steel UST and a 550-gallon steel UST) in 1990. According to the Limited Subsurface Investigation report (Clean Harbors, 1990), “minimal” contamination was encountered and excavated during the removal of the 550-gallon steel UST, however, the 2,000-gallon steel UST had several perforations on the sides and bottom of the tank and petroleum contaminated soils were encountered during the tank removal. One hundred cubic yards of contaminated soil were excavated and disposed off-site from the 2,000 gallon UST excavation. Soil borings were advanced and 3 groundwater monitoring wells were installed to determine the extent of soil contamination related to the 2,000-gallon UST release. No petroleum hydrocarbons were detected in the soil boring or groundwater samples following the removal of the UST; however TCA, 1,1-DCE, and 1,1-DCA were detected in one of the groundwater samples. Clean Harbors replaced the 550-gallon steel UST with a 550-gallon double walled fiberglass UST.

ATEC Associates removed a 2,500-gallon fuel oil UST in 1994. The tank was located south of the Reserve Center. While the tank was inspected and found to be in excellent condition, contaminated soil was encountered and a total of 63.5 tons of soil was removed. Final confirmation soil samples indicated that VOCs, SVOCs, and TPH were reported at either non-detect levels or below the RSR criteria.

The 550-gallon fiberglass UST was removed by Roy F. Weston, Inc. in 1997. Upon removal of the tank, it was inspected and it appeared to be in acceptable condition and no releases were noted. Soil samples were collected and analyzed for volatile petroleum hydrocarbons (VPH), extractable petroleum hydrocarbons (EPH), PCBs, and Resource Conservation and Recovery Act (RCRA)-8 metals. VPH and EPH analytes and PCBs were not detected. Several of the RCRA-8 metals were reported, but at concentrations that would be expected for background conditions.

The reports are included in Appendix D.

3.5 Review of Previous Environmental Reports

A review of reasonably available records produced several reports pertaining to the Property. The following subsections provide a brief summary of these reports. Copies of the reports, unless otherwise specified, are provided in Appendix D.

3.5.1 Nike Launcher Sites (Middletown and East Windsor, CT), a Photo Documentation of Two Nike Launcher Sites Slated for Demolition

The document was prepared by the USACE in 1988 and details the history of the Nike sites in the area and assesses the condition of the Property. The buildings were noted to be of cinderblock construction and to be in fair to good condition. The launcher area was overgrown and an established wetland area was noted on the southeast side of the launcher area. The launcher was in fair to poor condition. The underground components of the launchers (that is, the silos) were flooded and the elevators had been capped with rectangular concrete slabs. The launcher area was considered unsafe and recommended for demolition.

3.5.2 Letter Report, Limited Subsurface Investigation

Clean Harbors Environmental Engineering removed a 2,000-gallon No. 2 fuel, oil-steel UST and a 550-gallon No. 2 fuel, oil-steel UST in 1990. Inspection of the 2,000-gallon tank revealed several perforations on the sides and bottom of the tank and stained soil. One hundred cubic yards of contaminated soil were removed from the 2,000-gallon UST excavation and disposed offsite. Three soil borings were installed and completed with groundwater monitoring wells around the 2,000-gallon UST excavation to define the limits of the contamination. No petroleum hydrocarbons were detected in the soil boring or groundwater samples; however TCA, 1,1-DCA, and 1,1-DCE were detected in one of three groundwater samples. The 550-gallon steel tank was replaced with a 550-gallon, double-wall, fiberglass UST. Further site investigation was recommended to determine the source of the contamination.

3.5.3 Geohydrologic Study

As a follow up to the Limited Subsurface Investigation conducted by Clean Harbors Environmental Engineering in December 1990, the Geohydrologic Study was performed by the U.S. Army Environmental Hygiene Agency in June 1992. The purpose of the study was to conduct a limited environmental investigation to identify the source of TCA detected in groundwater. The study identified five areas of concern (AOCs):

- Three Nike Missile Silos. These silos were closed in 1988. Prior to closure, asbestos and hydraulic fluid were removed. The silos were then filled with a sand slurry and debris from the walls of the silos. While no samples were collected during the closure, solvents and metals are common contaminants associated with Nike missile site activities.
- Acid Neutralization Pit: located underneath the Garage (also known as the Warhead Building). These pits were typically used for disposal of waste liquids and solids at Nike sites. Wastes could have included waste POLs or solvents.
- 2,000-gallon UST
- Material storage (solvents)
- Septic Tank and Leaching Field. This was used until the facility was connected to the sanitary sewer system.

Fourteen groundwater monitoring wells were installed in June 1992 and one of the wells was found to be dry. Eight subsurface soil samples, one surface soil sample, and 13 groundwater samples were collected. Soil samples were analyzed for total metals, VOCs (except for 4 samples), SVOCs, and TPH. Groundwater samples were analyzed for dissolved metals, VOCs, SVOCs, TPH, nitrates/nitrites, pesticides and PCBs. TPH was detected in several of the surface soil samples, but only one exceeded the cited regulatory limit. The report concludes that petroleum products likely were used to control dust at the Property, and that the TPH detected in surface soil samples did not appear to present a threat to the groundwater. VOCs and SVOCs were not detected in the soil samples. Metals were detected in soil samples at concentrations similar to background levels.

Carbon tetrachloride, TCE, chloroform, and cis-1,2-DCE were detected in two groundwater samples. Carbon tetrachloride and TCE were detected at concentrations exceeding the CTDEP RSR criteria. Metals were detected in all groundwater samples at concentrations below applicable regulatory criteria.

The report recommended additional groundwater sampling.

3.5.4 Technical Report for Underground Storage Tank Closure

ATEC Associates removed a 2,500-gallon No. 2 fuel oil UST in March 1994. The tank was located south of the Reserve Center. Upon removal, the tank was inspected and found to be in excellent condition. No holes or areas of severe corrosion were noted during the tank inspection. However, contaminated soil was encountered and a total of 63.5 tons of soil was removed. Field screening and two soil samples of the final excavation were collected for VOCs, SVOCs, and TPH. The concentrations of the VOCs, SVOCs, and TPH were reported at either non-detect levels or below the RSR criteria. The confirmatory analytical data for the tank closure was included in the report.

3.5.5 Underground Storage Tank Closure Report

A UST was removed by Roy F. Weston, Inc., in January 1997. The 550-gallon, fiberglass UST contained Number 2 fuel oil. Upon removal of the tank, it was inspected and it appeared to be in acceptable condition and no releases were noted. Soil samples were collected and analyzed for VPH, EPH, PCBs, and RCRA-8 metals. VPH and EPH analytes and PCBs were not detected. Several of the RCRA-8 metals were reported, but at concentrations that would be expected for background conditions.

3.5.6 Environmental Baseline Study

The EBS was prepared in November 1998 by DTC for the demolition of three Nike missile structures on the Property (the Warhead Building, the Missile Test and Assembly Building, and the Former Barracks Building). The report appendices were not reasonably available for this report. The following issues were discussed in the EBS report:

- The EBS summarized the findings of the June 1992 Geohydrologic Study prepared by the U.S. Army Environmental Hygiene Agency. This report is discussed in Section 3.5.3 above.
- The EBS summarized excerpts from the January 30, 1997, Underground Storage Tank Closure Report prepared by Roy F. Weston, Inc. This report is discussed in Section 3.5.5 above.
- The EBS summarized the December 7, 1990, Limited Subsurface Investigation prepared by Clean Harbors Environmental Engineering. This report is discussed above in Section 3.5.2.
- The EBS summarizes a 1996 Floor and Storm Drain Inventory and Natural Resources Inventory, conducted by the USACE. The summary states that a wash rack with OWS is located approximately 25 feet north of the former Missile Test and Assembly Building. The wash rack discharges to the OWS, which discharges to the sanitary sewer. No information is summarized regarding natural resources.
- The EBS summarizes a 1996 Total Facility Assessment Report prepared by the Fort Devens Engineering Team. The EBS summary indicates that the former Missile Test and Assembly Building is referred to as a maintenance shop and the former Warhead Building is referred to as Cold Storage Building. No vehicle maintenance was performed in the building at the time of the 1996 site visit, however, three 55-gallon drums of unknown content were observed in a historical photograph taken from outside of the former Missile Test and Assembly Building/OMS. Two of the drums were on secondary containment pallets in the photograph. The Fort Devens Facilities Engineering Team did not observe drums or any staining during the 1996 site visit.
- The EBS summarizes the results of a National Environmental Policy Act (NEPA) Screen conducted to identify the 100-year and 500-year floodplains, floodways, historic districts, archaeological and Indian burial sites; and threatened and endangered species

which may be impacted during the proposed demolition of the site buildings. This information has been incorporated in Section 7 of this report.

- The EBS states that asbestos surveys were performed historically on the Property in 1990 and in 1995. The surveys identified 144 square feet of 12-by-12-inch floor tile; 5,250 square feet of 9-by-9-inch floor tile; 275 linear feet (lf) of pipe insulation and associated fittings; 2,220 square feet of asbestos cement board; 23 thermal insulation mud fittings; and 100 square feet of water tank insulation. During the EBS visual inspection, asbestos-containing material (ACM) also was identified in the roofing materials of the Missile Test and Assembly Building. The buildings containing this ACM were demolished sometime after 1998.
- XRF technology identified LBP in all three buildings slated for demolition, however, a composite sample of building materials tested for toxicity characteristic leaching procedure (TCLP) lead did not contain levels above the detection limit.
- Four soil samples were collected during the EBS, two samples each from beneath the concrete slabs in the Warhead Building and the Missile Test and Assembly Building and analyzed for VOCs, SVOCs, PCBs, TPH, and RCRA metals. Total barium was detected in all four soil samples at concentrations below the CTDEP Residential Direct Exposure Criteria (DEC). TPH was detected in two soil samples at levels below the State Residential DEC. No other constituents were detected.
- The EBS indicates that the Property is listed with the State of Connecticut as "being suspect regarding the release of solvents, oils, and PCBs to the ground." A No. 2 fuel oil spill was reported at the site in 1992 from a transfer line, which reportedly impacted groundwater.
- During the EBS visual inspection the following observations related to environmental conditions were made:
  - Warhead Building. A-6-by-6-foot, soil-filled pit was identified approximately 25 feet southeast of the Warhead Building, which historically contained acid. A flammable materials cabinet, located just west of the northwest corner of the building, contained three 1-gallon paint cans; four quart-sized paint cans; eight aerosol paint cans; and two 1-gallon cans of paint thinner. No staining or evidence of a release was observed on the ground near this storage cabinet, and the cans were all in fair to good condition.

3.5.7 Stormwater Pollution Prevention Plan

The SWP3 was prepared by the USGS in September 1999. The plan stated the USAR Center posed a "moderate" risk to surface waters of the State of Connecticut, because of the disposal of PPMs behind the "control building" (also known as the former Warhead Building or Garage) and potential leaks from military vehicles parked in an unpaved area. PPMs include any hazardous material that could come in contact with precipitation or stormwater runoff. While the report did not include a hazardous material inventory, it did note that a pool of POL was present within the secondary containment berm of the POL shed (located in the Nike missile silo area) and that discarded aerosol paint cans, some quart and gallon size paint cans, and a half-empty 1-gallon can of wood cleaner were present in an unused flammables materials storage cabinet located in the paved area behind the control building. Although no spill sites were noted in the report, it was recommended that military vehicles be parked only in an established military equipment parking (MEP) with drip pans.

The SWP3 also identifies the OWS and the wash rack on the Property, and reports that it was no longer used and was last serviced in October 1999 (however, the date of the SWP3 is September 1999).

3.5.8 94th Regional Support Command Water Quality Survey

The water quality survey was performed to evaluate water quality and provided recommendations to ensure that water is of good quality to protect human health. It was performed by the U.S. Army Center for Health Promotion and Preventative Medicine in February 2003. The water in the facility was found to be within potable standards, but the water still was found to be turbid and had a bad taste. The water also was found to be "aggressive" in nature due to pH levels or because sodium hydroxide was added to the water before discharging from the water treatment plant. The aggressive nature of the water could cause the leaching of lead from the piping system. Recommendations were made to replace the system with a new system using polyvinyl chloride (PVC) piping. It also was recommended that a point-of-use water filtration be installed to reduce the turbidity and that a daily flush plan should be implemented to remove metals from the water.

3.5.9 Groundwater Monitoring Report

The draft Groundwater Monitoring Report was submitted in August 2006 by Kemron Environmental Services. The report summarizes investigation activities conducted at the Property between 1990 and 1998, presents the groundwater data collected from the August 2005 and the February 2006 sampling events, and provides recommendations regarding whether a remedial investigation is warranted.

Five wells were sampled in August 2005, and nine wells were sampled in February 2006. Groundwater samples were generally analyzed for TPH, VOCs, SVOCs, and total and dissolved metals. Metals were detected in groundwater during both sampling events, but at levels below the applicable RSR criteria. Cis-1, 2-DCE and toluene were detected at concentrations below the applicable RSR criteria. Carbon tetrachloride, chloroform, and TCE were detected, but only TCE exceeded the applicable RSR criteria. No site-related SVOCs were detected in any of the groundwater samples. TPH was detected in one well, but at a concentration below the applicable RSR criteria.

The source of the TCE contamination was not identified, however, based on the sample locations is suspected be the former Garage (also known as the Warhead Building) and/or Maintenance Shop (also known as the Missile Test and Assembly Building) or former USTs. The former Nike missile silos are located side-gradient to the observed contamination, therefore, they are less likely to be the source.

The report recommends a supplemental investigation to further investigation potential sources of soil impacts that could explain the contamination noted in the impacted monitoring well. Additionally, a groundwater investigation was recommended to attempt to delineate the extent of VOC impacts observed. The recommendations are detailed in the report and are under review by the 94th RRC for implementation.

3.5.10 Historic Resources Inventory

A historic resources inventory was conducted at the facility by the Public Archaeology Laboratory in 1995. The Historic Inventory Report consisted of five completed inventory forms, a short description of the building, and a site history. The following five buildings were assessed:

- Storage Building—Originally built in 1956 as the Nike Enlisted Men's Barracks and Officers Quarters and was a one-story structure consisting of two contiguous wings. The building was constructed of concrete block with shed roofs. The building was converted into a Reserve Center and then used for storage after the new reserve Center was constructed in 1987.
- Storage Building—Originally built in 1958 as the Missile Assembly and Test Building and was a one-story structure built on a concrete slab with concrete block walls and a flat roof.
- Storage Building—Originally built in 1956 as the Nike missile Warhead Building and was a one-story structure built on a concrete slab with concrete block walls and a flat roof.
- Sentry Station—Originally built in 1956 as a sentry station, this is a one-story, 8-by-6.5-foot, concrete block building on a concrete slab.
- Reserve Center—a 16-by-74-foot brick building with a flat roof constructed in 1987. The building is situated on the brow of an open, terrace hillside. After construction, earth beams were piled up against the foundations on the northeast, northwest, and southeast sides of the building.

The report does not provide a summary of the historical significance of the buildings on the property.

4 Adjacent Properties

Adjacent property land uses are significant to the ECP process, as these current or past uses may have an environmental impact on the USAR Center. Typically adjacent properties within 0.25 mile of the USAR Center property boundaries are reviewed and surveyed visually. For the purposes of this ECP, the adjacent property reconnaissance was performed from the USAR Center property boundaries and from public access points. Historical aerial photographs and topographic maps also were reviewed for conditions or activities that may have had an environmental impact on the Property.

4.1 Land Uses

During the site reconnaissance, the adjacent properties were undeveloped. No evidence of past development of the adjacent lands was noted in aerial photos taken in 1989 and 1995 or on topographic maps from 1965, 1972, 1984, and 1992. An area to the east, approximately 0.4 mile away, has a residential development that has been present, according to topographic maps, since before 1965.

4.2 Findings

The EDR database search results were reviewed for any evidence that adjacent properties may have past or present environmental issues that would impact the USAR Center. The areas adjacent to the Property were undeveloped and appeared to be open, unused land. No major activities on the properties were identified during the site interviews.

Water well databases at the federal and state level were reviewed to identify any water supply source near the Property. Two water wells were found on the USGS database within 0.02 and 0.5 mile of the property. The owners of the wells were not specified in the EDR report, and they are not listed as wells used as drinking water sources.

5 Review of Regulatory Information

An essential component of an ECP is the review of records and databases containing information on the Property and adjacent properties. The review includes reasonably obtainable federal, state, and local government records, and is intended to identify a release or likely release of any hazardous substance or any petroleum product, which is likely to cause or contribute to a release or threatened release of any hazardous substance or any petroleum product to the Property.

The majority of the regulatory information for this ECP was obtained from EDR on July 13, 2006. EDR provides a regulatory database summary that consolidates standard federal, state, local, and tribal environmental record sources based on ASTM D6008 recommended minimum search distances from the Property.

All findings reported in Sections 5.1, 5.2, and 5.3 below are from the EDR report unless otherwise noted. A copy of the complete EDR report is included in Appendix E.

5.1 Federal Environmental Records

5.1.1 Federal National Priorities List Sites within 1 Mile

USEPA maintains a record of the nations' worst uncontrolled or abandoned hazardous waste sites, known as the National Priorities List (NPL). Sites on the NPL undergo long-term remedial action under CERCLA. The USAR Center is not an NPL site, nor were any such sites located within 1 mile of the Property.

5.1.2 Federal Comprehensive Environmental Response, Compensation and Liability Act Information Systems Sites within 0.5 Mile

The CERCLA Information System (CERCLIS) contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies, and private persons, pursuant to Section 103 of the Act. CERCLIS contains sites that are either proposed to be or are on the NPL and sites that are in the screening and assessment phase for possible inclusion on the NPL.

The USAR Center is not a CERCLIS site and there are no CERCLIS sites located within 0.5 mile of the center.

5.1.3 Resource Conservation and Recovery Act Corrective Action Sites within 1 Mile

RCRA corrective action (CORRACTS) sites represent facilities that have generated or managed hazardous wastes and require corrective action. The USAR Center is not a CORRACTS site, nor were any such sites identified within one mile of the USAR Center.

5.1.4 RCRA Treatment, Storage, and/or Disposal Sites within 0.5 Mile

RCRA defines and regulates sites that generate, transport, or provide treatment, storage, or disposal (TSD) of hazardous wastes. The RCRA Information System (RCRIS) includes selective information on these sites.

The USAR Center is not a RCRIS-TSD site and there are no such sites located with 0.5 mile of the USAR Center.

5.1.5 Federal RCRA Small and Large Quantity Generators List within 0.25 Mile

Conditionally exempt small quantity generators are defined as facilities generating less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month. RCRA small quantity generators are defined as facilities generating between 100 kg and 1,000 kg of hazardous waste per month. A facility generating more than 1,000 kg of hazardous waste or over 1 kg of acutely hazardous waste per month is defined as a large quantity generator.

The USAR Center is not a small-quantity generator or large-quantity generator site, nor were any such sites located within 0.25 mile of the Property.

5.1.6 Federal Emergency Response Notification System List

The federal Emergency Response Notification System (ERNS) List maintains information on reported releases of oil and hazardous substances. The USAR Center is not on this notification list.

5.2 State and Local Environmental Records

Most of the information presented in this subsection was obtained from the EDR report. Additional information was also obtained from online database searches of the State of Connecticut's databases. No state and local agency personnel were interviewed via telephone during this assessment.

5.2.1 State Lists of Hazardous Waste Sites within 1 Mile

The USAR Center is not on the state list of hazardous waste sites. One site, the J.J. Vinci Coal Company, was identified within 1 mile of the USAR Center, and its information is summarized in Table 1. The company was cited for the alleged burial of drums and the presence of a lagoon. The USAR Center is upgradient of the site; therefore, any migration from the J.J. Vinci site would not affect the Property. Additionally, the EDR Report documented that remediation actions at the site were completed and approved by the CTDEP on July 13, 1989.

TABLE 1
Nearby State Hazardous Waste Sites
Middletown USAR Center, Middletown, CT

Company/Site	Address	Distance and Direction from Property	Regulatory Status	Elevation Relative to Property
J.J. Vinci Coal Company	1000 Newfield Street Middletown, CT 06457	Approx 5,260 ft. NE	Active	Lower

5.2.2 State-Registered Landfills or Solid Waste Disposal Sites within 0.5 Mile

The USAR Center does not have a solid waste landfill, incinerator, or transfer station within the Property boundaries.

No adjacent properties within 0.5 mile of the USAR Center have a solid waste landfill, incinerator, or transfer station.

5.2.3 State-Registered Leaking UST Sites within 0.5 Mile

In addition to information obtained from the EDR report, the CTDEP maintains a comprehensive database of leaking UST (LUST) sites. The USAR Center is not listed in the state LUST database.

However, within 0.5 mile of the Center, one LUST site was identified. A 1-gallon No. 2 diesel fuel spill from the Kasden Elm City fuel tank was reported in July 1989. Table 2 summarizes the information relative to the USAR Center, and provides the status of its corrective action. The site is downgradient of the Property and, therefore, offsite migration from this site will not impact the Property.

TABLE 2
Nearby Leaking Underground Storage Tank Sites
Middletown USAR Center, Middletown, CT

Company/Site	Address	Distance and Direction from Property	Regulatory Status	Elevation Relative to Property
Kasden Elm City Fuel	397 Mile Lane Middletown, CT 06457	Approx 1,330 ft. ENE	Inactive	Lower

5.2.4 State-Registered UST Sites within 0.5 Mile

The USAR Center is not a state-registered UST site, nor were any such sites identified within 0.5 mile of the USAR Center.

5.2.5 State Spills Incidents

The USAR Center is not listed on the Connecticut state petroleum spill list. However, the 1998 EBS indicates that a No. 2 fuel oil spill from a transfer line was reported in 1992.

5.2.6 Records of Contaminated Public Wells

The City of Middletown Water and Sewer Board does not own or operate any municipal water supply wells within 0.25 mile of the USAR Center.

5.2.7 Voluntary Remediation Program Sites within 0.5 Mile

The USAR Center is not listed in the Connecticut Brownfields Program (the successor to the Voluntary Cleanup Program). No sites located within 0.5 mile of the USAR Center are listed as being in the Brownfields Program.

5.2.8 State Registered Bulk Fertilizer and Pesticide Storage Facilities within 0.25 Mile

The USAR Center is not registered with the state as a bulk fertilizer and pesticide storage facility. Additionally, no adjacent properties within 0.25 mile were registered as one of these facilities.

5.3 Unmapped Sites

Some sites within the ASTM D6008 recommended minimum search distances have the same zip code as the USAR Center, but no street address. These sites, known as unmapped or orphan sites, can not be mapped from the EDR results alone. None of the sites were located within corresponding ASTM D6008 recommended minimum search distances.

5.4 Summary of Properties Evaluated to Determine Risk to the Property

To summarize Subsections 5.1 through 5.3, two separate properties, near or adjacent to the USAR Center, were evaluated as potential risks to the Property. These adjacent properties evaluated were identified as a result of information obtained during area reconnaissance, interviews, and regulatory database searches, and are summarized below in Table 3.

Based on an evaluation of reasonably available information and details concerning the properties listed in Table 3, none of the facilities evaluated exhibit significant environmental conditions that have the probability of adversely affecting the environmental conditions at the Property. The Kasden Elm City Fuel property and the J.J. Vinci Coal Company are located downgradient of the Property, therefore, have minimal potential to impact the Property. Additionally, the EDR report indicates that all remedial actions at the site were completed and approved by the CTDEP, therefore, impacts to the Property are unlikely.

TABLE 3
Properties Evaluated for Potential Environmental Risks
Middletown USAR Center, Middletown, CT

Company/Site	Database	Elevation Relative to Property?	Potential Impact on the Property?	Comments
Kasden Elm City Fuel	LUST	Lower	No	Downgradient of the Property
J.J. Vinci Coal Company	SHWS	Lower	No	Downgradient of the Property

Notes: SHWS = State Hazardous Waste Site

6 Site Investigation and Review of Hazards

Findings documented in the following subsections are based on the August 22, 2006, site reconnaissance, a review of reasonably available records, search of federal and state environmental databases, and information obtained from USAR personnel.

6.1 Underground Storage Tanks/Aboveground Storage Tanks

No ASTs or USTs were present on the property during the site reconnaissance. Four USTs were removed from the Property as described in Section 3.4.

6.2 Inventory of Chemicals/Hazardous Substances

Chemicals used and stored at the Property at the time of the site reconnaissance were associated with facility maintenance activities and janitorial services. Janitorial chemicals such as window cleaner, toilet bowl cleaner, tub-tile cleaners were stored in cabinets, in the bathroom area, and in the janitorial area. Building maintenance-related products such as latex paints, spray paints, lubricants, minor amounts of motor oil, and so forth were stored in flammable cabinets located in the storage bay in the south side of the Reserve Center.

Certain types of chemical products used and stored at the Property historically would have contained hazardous substances pursuant to CERCLA 101(14) (42 USC 9601(14)). Historical storage of these substances is discussed in Section 3.3.1 above.

6.3 Waste Disposal Sites

Available records and interviews did not indicate the practice of onsite waste disposal associated with the USAR activities other than through managed storage and offsite disposal, or through the sewer or septic systems. No waste disposal sites were observed during the site reconnaissance, nor were any signs of past onsite waste disposal (such as stressed vegetation or suspicious depressions in the landscape) observed.

The potential for historical waste disposal, primarily into the drainage field, is discussed in Section 3.3.1 above.

6.4 Pits, Sumps, Drywells, and Catch Basins

An acid neutralization pit has been reported in several documents and by site personnel in the former Warhead Building (also known as the Garage) during the operation as a Nike missile facility. The foundation of Warhead Building still was present south of the Reserve Center. A slight depression existed in the asphalt around the foundation and it was noted through site interviews that the depression was the acid neutralization pit. No stressed vegetation or staining was noted in the area.

There is a wash rack that discharges to an OWS located approximately 25 feet north of the former missile test and assembly building (also known as maintenance building). The wash rack reportedly discharged to the OWS and exits the site via the sanitary sewer (DTC, 1998). Reports indicate that the OWS was no longer in use as of 1999. It was last serviced in October of 1999 (USGS, 1999).

6.5 Asbestos-Containing Material

The Reserve Center was built in 1987. Because of the recent date of construction, asbestos likely was not used in construction materials for the building. ACM previously located at the facility is discussed in Section 3.5.6 above.

6.6 PCB-containing Equipment

No transformers or other DoD-owned, PCB-containing equipment were noted during the site reconnaissance, and no documented surveys of the facility were available at the time of this report preparation. Site personnel indicated during the site reconnaissance that if PCB-containing equipment was present, it most likely was removed during the demolition of the Nike missile buildings.

6.7 Lead-based Paint

Because the Reserve Center was constructed after 1978, there is limited potential for LBP. At the time of the site reconnaissance, the painted surfaces at this facility were in good condition. The historical presence of LBP in demolished buildings is discussed in Section 3.5.6 above.

6.8 Radon

Radon surveys have not been performed for the Property. USEPA and USGS predicted an average screening level of 2 to 4 picoCuries per liter of air (pCi/L) in Middlesex County. USEPA has recommended 4 pCi/L as an action level for radon abatement. Based on this information, the radon concern is considered low for the Property because average levels in the area are below 4 pCi/L.

6.9 Munitions and Explosives of Concern

Based on a review of available records, the site reconnaissance, and interviews with USAR Center personnel, there are no indications that munitions and explosives of concern (MEC) are or were present at the Property. As one of two Hartford Defense Area sites retained in the early 1960s, Nike-Hercules missiles, which were armed with tactical nuclear warheads and Nike Ajax missiles were present on the Property. The primary munitions associated with Nike sites included the Hercules missiles themselves and missile propellants and fuels. These propellants and fuels could have included jet fuel (JP-4), perchlorate (solid rocket fuel), analine-furfuryl alcohol (starter fuel), IRFNA (rocket fuel oxidizing agent), and UDMH (starter fluid). The exact components comprising the warheads, missile propellants and fuels used at the Property were not detailed in the reports reviewed during the preparation of this ECP report. Due to the highly reactive nature of the liquid fuels, great care typically was taken during missile fueling activities. Liquid rocket fuels rarely were spilled in significant quantities. All facilities associated with the former use of the Property as a Nike missile battery have been demolished. There were no records that indicate the warheads were handled improperly.

6.10 Radioactive Materials

Based on a review of available records, the site reconnaissance, and interviews with USAR Center personnel, there is no indication that radioactive materials were released at the USAR Center. Nike Hercules missiles likely were armed with nuclear warheads. The radioactive materials (electron tubes) in these missiles were shipped, stored, handled and disposed of in accordance with technical manuals (USACE, 2003). Periodic wipe tests were performed to identify radioactive leaks. The wipes were to be disposed of in lead-lined drums as radioactive waste but frequently were disposed of as regular solid waste. However, no accounts of radioactive leakage have been identified at Nike missile sites (Law Engineering Testing Company, 1986).

7 Review of Special Resources

7.1 Land Use

The City of Middletown has designated this Property and surrounding properties as Residential. The Property is located in an area that consists mostly of undeveloped land, with residential use east of the Property.

7.2 Coastal Zone Management

The Office of Long Island Sound Program (OLISP) is the lead agency for the Connecticut Coastal Management Program. OLISP defines coastal zone as area within 1,000 feet from a tidal river or the shore. This Property is not included in the coastal zone management plan nor is it in a coastal zone.

7.3 Wetlands

According to the 1988 U.S. Fish and Wildlife Service (USFWS) National Wetlands maps (Figure 10, Appendix A), no wetlands are located on the Property, or on adjacent properties. However, a 1988 report on the Nike launcher sites indicates the presence of a well established wetland on the southern end of the facility. During the August site reconnaissance for this ECP report, a dry creek bed was observed on the southern end of the property.

7.4 100-year Floodplain

A review of the Federal Emergency Management Agency (FEMA) digital Flood Hazard Area map indicates that the Property is not located within the 100-year floodplain. Figure 11 in Appendix A provides a map of the 100-year floodplain elevations located in the immediate vicinity of the Property.

7.5 Natural Resources

The EBS summarizes a NEPA Screen conducted in advance of building demolition in the late 1990s. The NEPA Screen did not identify any endangered or threatened species on the Property based on a review of the federal and state list of endangered or threatened species contained in Department of Environmental Protection's (DEP) Natural Diversity Data Base.

7.6 Cultural Resources

A historical resource inventory report for the Property was prepared in 1995. The report describes five buildings, four of which have since been demolished. The State of Connecticut Historical Commission stated that the demolition activities would not impact any historic, architectural, or archaeological resources listed or eligible for the National Register of

Historic Places. The current structure, the Reserve Center, was built in 1987 and based on the date of construction would not meet the criteria for inclusion on the register. Appendix D provides a copy of the report.

8 Conclusions

The following information was obtained after reviewing available historical information, conducting interviews with knowledgeable parties connected with the Property or with state and local agencies, and conducting a reconnaissance of the Property and adjacent properties.

8.1 Findings

Hazardous Substances. According to USAR personnel and site records, onsite disposal of hazardous substances pursuant to CERCLA 101(14) (42 USC 9601(14)) or wastes has occurred at the Property. Given the primarily administrative nature of USAR activities at the Property, these releases likely are related to activities conducted at the Property when it operated as a Nike missile facility. Hazardous substances were commonly associated with Nike missile operations including:

- Solvents, POLs, and paints used during missile assembly and disassembly
- Solvents and lubricants used as part of missile fueling operations
- Solvents, paints, and hydraulic fluids used in the missile silos
- Drain tile fields which could have received hazardous substances discharged into facility drains.

Various site investigations have been performed on the Property, which indicate that both soil and groundwater have been impacted by historical releases. The investigations report that TCA, 1,1-DCE, 1,1-DCA, carbon tetrachloride, TCE, chloroform, TPH, cis-1,2-DCE and toluene have been detected in the groundwater. TCE is the only constituent that consistently has been detected at concentrations exceeding the applicable CTDEP RSR criteria. The source of this contamination has not been identified and is suspected to be in the areas around the Garage, Maintenance Building, and/or the Nike missile silo area. Investigations are still underway to determine the nature and extent of contamination.

During the site interviews, site personnel noted the historical application of chlordane under the foundations of the Nike missile buildings. A 1999 report also notes that PPMs were potentially improperly disposed of behind the Garage. The report does not specify the types of PPMs.

An OWS is located on the property. The OWS has not been used since at least 1999 and it reportedly was serviced last in 1999. Older OWSs frequently leak, and, therefore, may be a potential source of observed groundwater contamination.

While not hazardous substances, petroleum products reportedly were used on the Property to control dust.

USTs/ASTs. No ASTs have been located at the USAR Center. However four USTs containing No. 2 fuel oil have been removed from the Property. A 2,000-gallon No. 2 fuel oil UST was removed in December 1990. One hundred cubic yards of petroleum-contaminated soil were excavated and disposed offsite. A subsequent investigation detected TCA,1,1-DCE, and 1,1-DCA in the groundwater, however, the UST is not suspected to be the source of the groundwater contamination.

A 550-gallon steel No. 2 fuel oil UST was also removed in 1990. The report indicates that "minimal" contamination was observed during removal of this tank.

A 2,500-gallon No. 2 fuel oil UST was removed in March 1994 along with 63.5 tons of petroleum-impacted soil. Confirmation soil samples collected following the excavation indicate that VOCs, SVOCs, and TPH were either non-detect or below the CTDEP regulatory criteria.

A 550-gallon fiberglass No. 2 fuel oil tank was removed in 1997. According to the closure documents, there is no evidence of a petroleum release from this UST.

Non-USTs/ASTs Petroleum Storage. No non-UST/AST petroleum storage was observed at the facility during the site reconnaissance. Historical reports indicate the presence of 55-gallon drums (contents unknown), hydraulic fluids, lubricants, and fuels historically at the Property. A POL shed was formerly located in the Nike missile silo area on the Property. A pool of POL was noted in the bottom of this shed during a 1999 site visit. The POL pool was no longer present during the 2006 site reconnaissance.

PCBs. No transformers or other DoD-owned, PCB-containing equipment were noted during the site reconnaissance, and no documented surveys of the facility were available at the time of this Draft ECP report preparation. Site personnel indicated during the site reconnaissance that if PCB-containing equipment was present, it was most likely removed during the demolition of the Nike missile buildings

ACM. The only remaining buildings at the USAR Center were built in 1987. Because of the recent date of construction, asbestos was not likely present in any of the construction materials used for this building.

LBP. Because the USAR Center was constructed after 1978, there is limited potential for LBP. At the time of the site reconnaissance, the painted surfaces at this facility were in good condition.

Radiological Materials. Based on a review of available records, the site reconnaissance, and interviews with USAR Center personnel, there is no indication that radioactive materials were released at the USAR Center.

Radon. Radon surveys have not been performed for the Property. Based on the USEPA and USGS predicted average screening level of 2 to 4 pCi/L of air in Middlesex County, the radon concern is considered low for the Property because average levels in the area are below the USEPA-recommended action level.

MEC. Available records do not indicate any MEC currently or formerly located at this Property.

Surrounding Properties. Potential environmental sites of concern, located within the ASTM D6008 recommended minimum search distances from the Property, were evaluated through database review and site reconnaissance. None of the adjacent properties evaluated exhibited environmental conditions that had or have the potential to adversely affect environmental conditions at the Property.

Wetlands and Floodplain. According to the 1988 USFWS National Wetlands maps and visual observations, no wetlands were observed on the Property, or on adjacent properties. However, a 1988 report noted that a well-established wetland was present at the Property.

A review of the FEMA digital Flood Hazard Area map indicates that the Property does not lie within the nearest 100-year floodplain.

Threatened and Endangered Species. A NEPA Screen conducted in the late 1990s did not identify any endangered or threatened species on the Property based on a review of the federal and state list of endangered or threatened species contained in DEP's Natural Diversity Data Base.

Archaeological and Historical Resources. Because the Reserve Center building was constructed in 1987, it is not yet eligible for listing on the National Register of Historic Places.

8.2 Environmental Condition of Property

Findings of this ECP report were based on reasonably available environmental information, interviews with site and state and local personnel, review of previous environmental studies and federal and state databases, and file information related to the storage, release, treatment, or disposal of hazardous substances or petroleum products. Results also were based on visual observations of the Property and adjacent properties.

In accordance with DoD policy defining the classifications (see Sherri Goodman Memorandum dated 21 October 1996), the Property has been classified into one of seven property types. Based on the results of this ECP study, the property has been assigned an overall DoD Environmental Condition Type 7. The property type is based primarily on the following major findings.

- The presence of various contaminants (TCA, 1,1-DCE, 1,1-DCA, carbon tetrachloride, TCE, carbon tetrachloride, chloroform, extractable total petroleum hydrocarbons [ETPH], cis-1,2-DCE , and toluene) in the groundwater. The source of this contamination is unknown and investigations are currently underway.
- Potential releases from the former septic system/drain tile field that was historically used for the Nike missile site.
- The possible improper disposal of PPMs behind the garage.

9 References

Persons Contacted

- Steve Lombardi, 94th Regional Readiness Environmental Contractor, 978-796-2607, August 21, 2006
- Gary Puryear, Director 94th Regional Readiness Environmental Department, August 21, 2006
- Sgt. Brooks, 1205th TROB, Cell 203-980-6683. Transferred to 226th TROB in Chicopee, MA.

Resources Consulted

- Aerial Photographs provided by EDR dated 1998, and 1995.
- Undated Aerial Photograph provided by Sgt. Brooks during the Site visit on August 21, 2006.
- FEMA Flood Hazard Insurance Map, http://msc.fema.gov/webapp/wcs/stores/servlet/FemaWelcomeView
- USFWS National Wetlands Inventory maps
- USEPA Map of Radon Zones, http://www.epa.gov/radon/zonemap.html
- OSLIP, http://www.dep.state.ct.us/olisp/index.htm.
- Federal Regulatory Databases
  - NPL, April 20, 2006
  - Proposed NPL Sites
- State and Local Regulatory Databases
  - Underground Storage Tank Data

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Appendix A
Figures

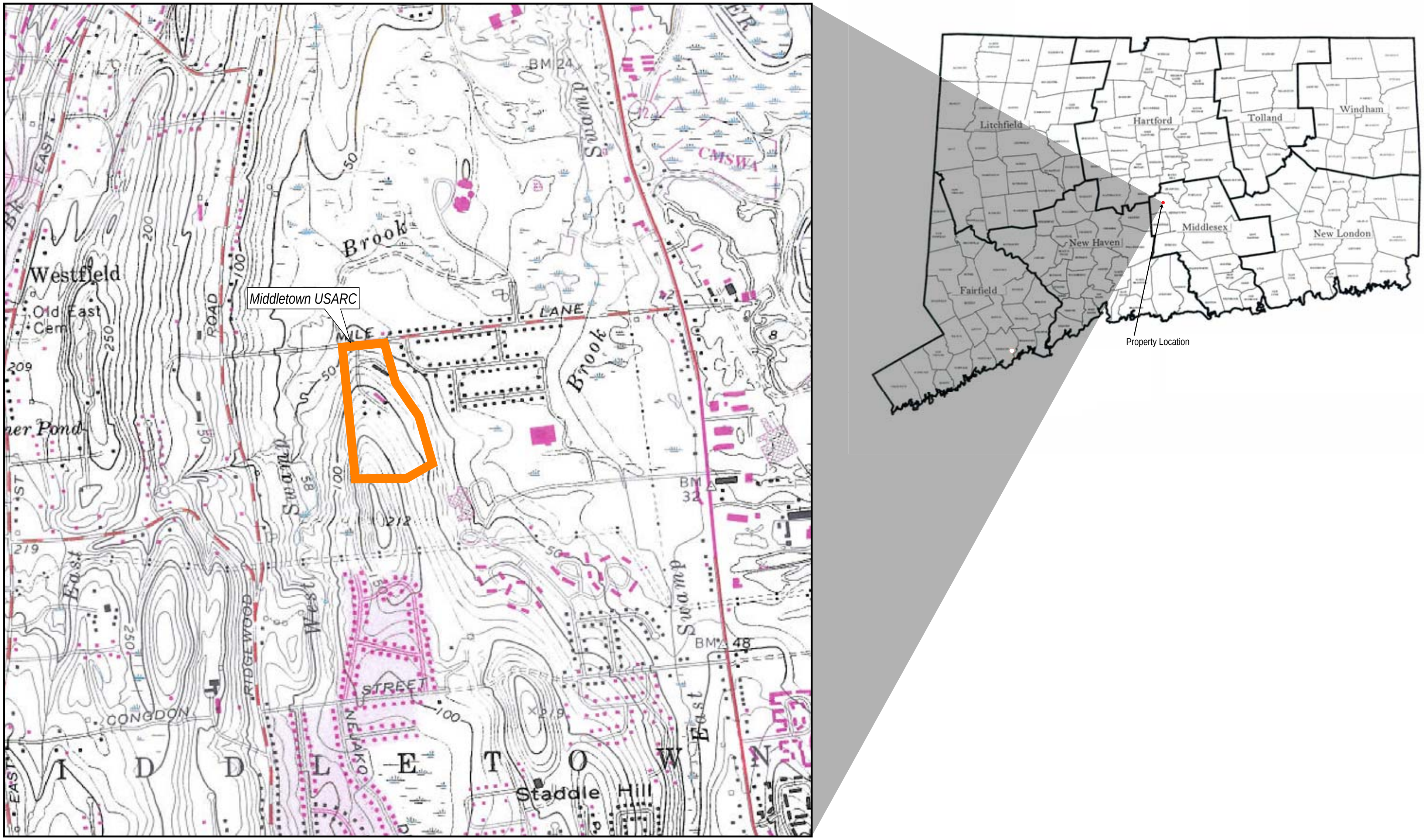

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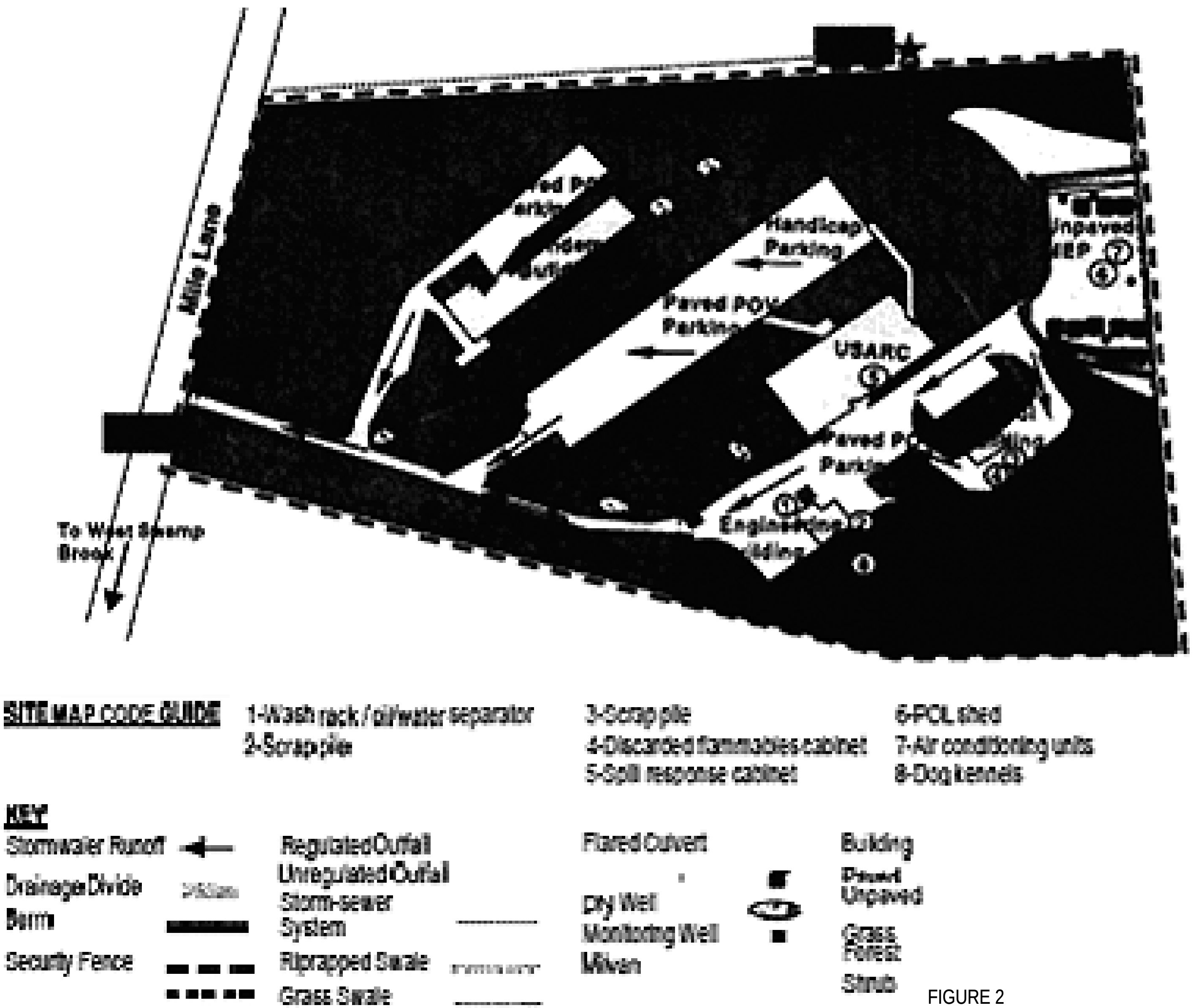
FIGURE 1
General Site Location Map
Phase I ECP Report
Middletown U.S. Army Reserve Center



North

Not To Scale

FIGURE 2
Site Layout Plan
Phase I ECP Report
Middletown U.S. Army Reserve Center

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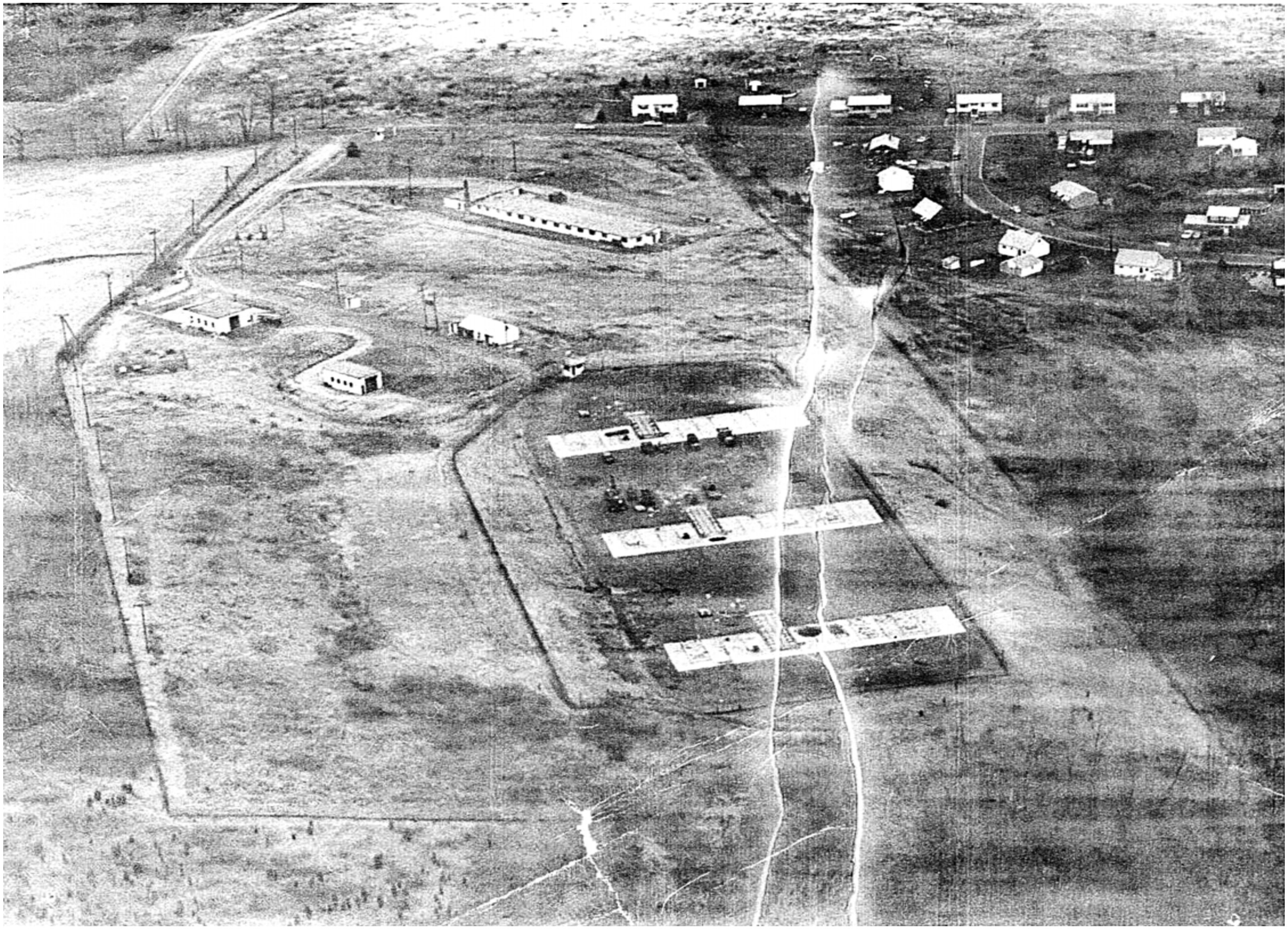

FIGURE 3
Nike Missile Site Aerial, Date Unknown
Phase I ECP Report
Middletown U.S. Army Reserve Center

Scale Unknown

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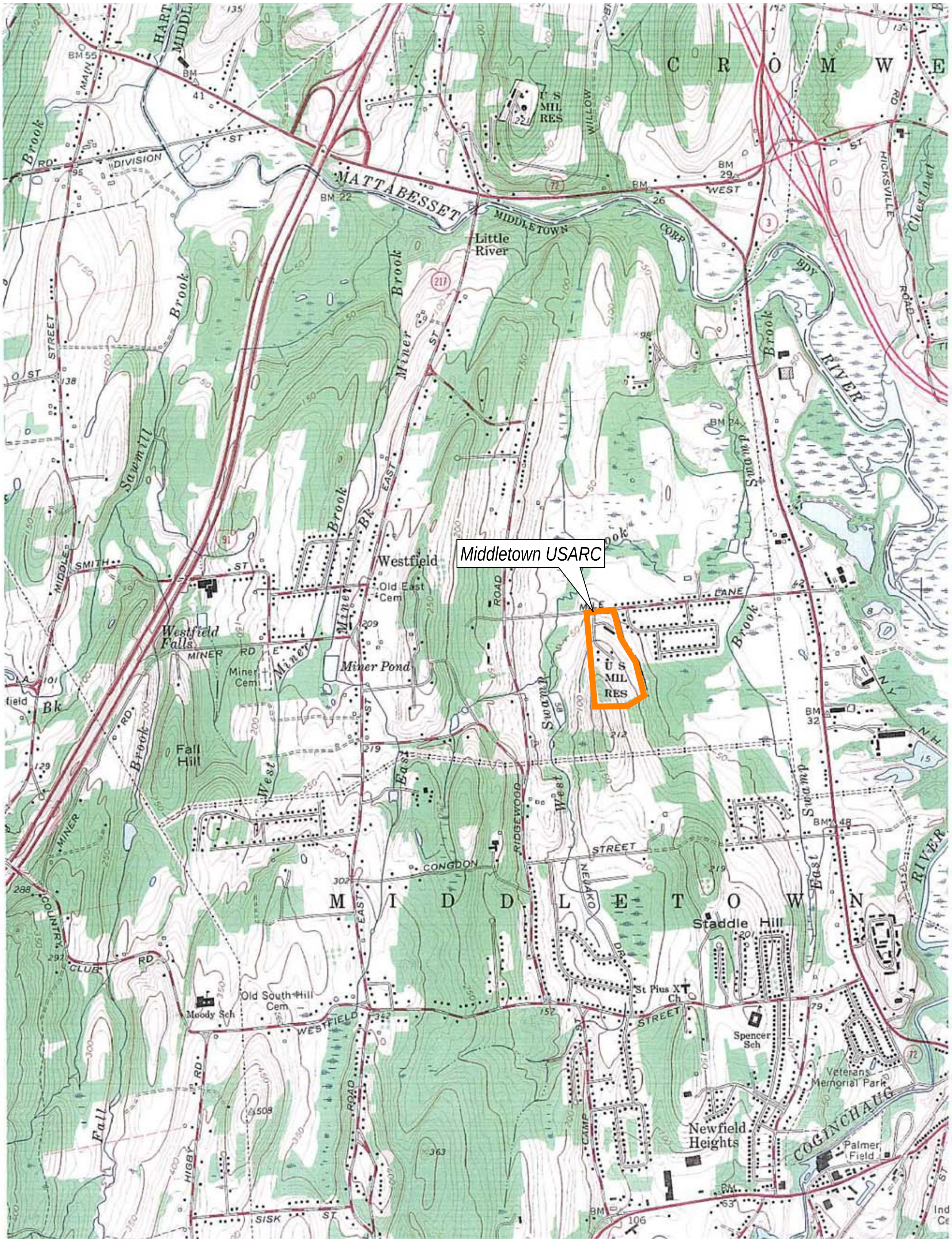

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FIGURE 4
1965 USGS 7.5 Minute Topographic Map, Middletown
Phase I ECP Report
Middletown U.S. Army Reserve Center

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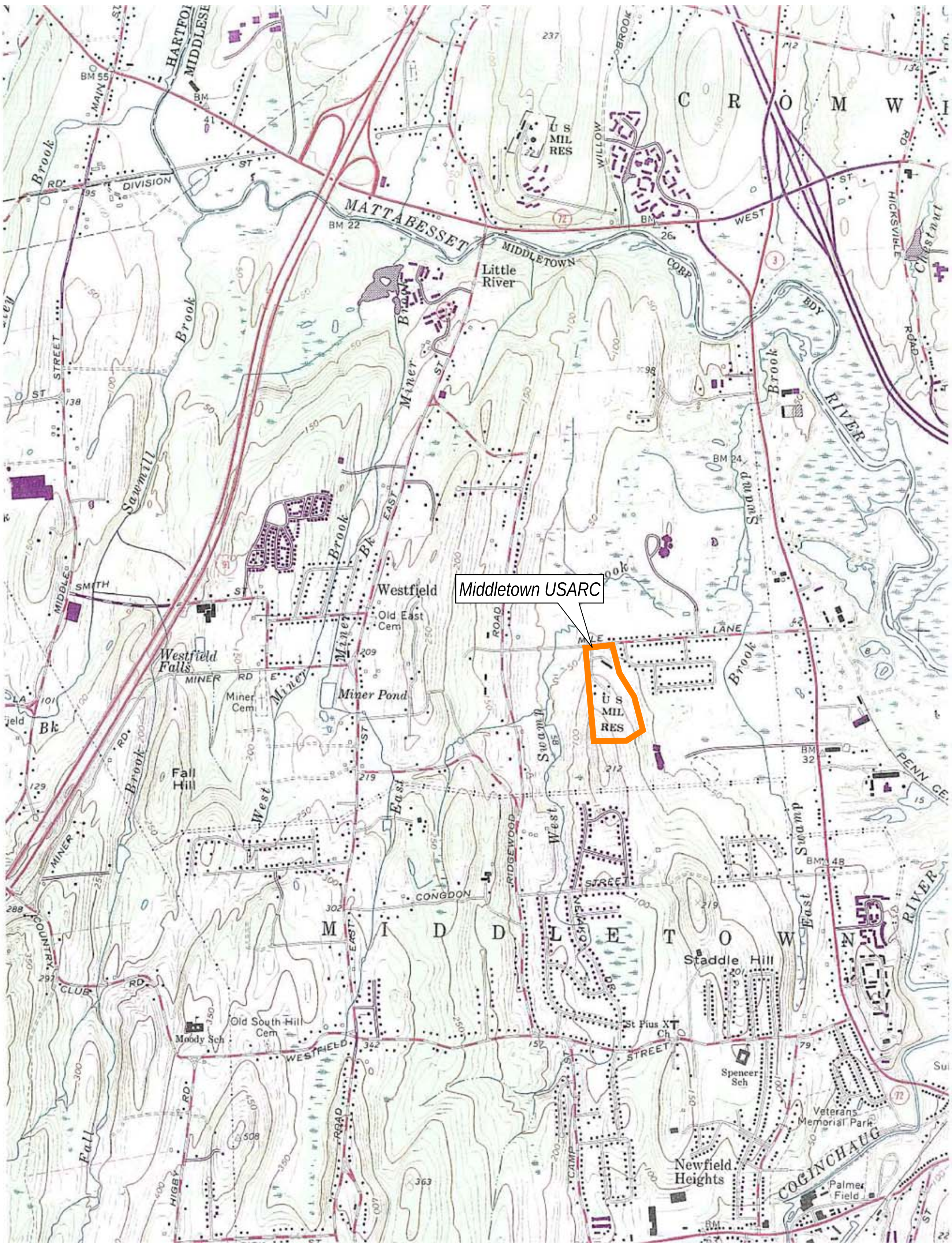

FIGURE 5
1972 USGS 7.5 Minute Topographic Map, Middletown
Phase I ECP Report
Middletown U.S. Army Reserve Center

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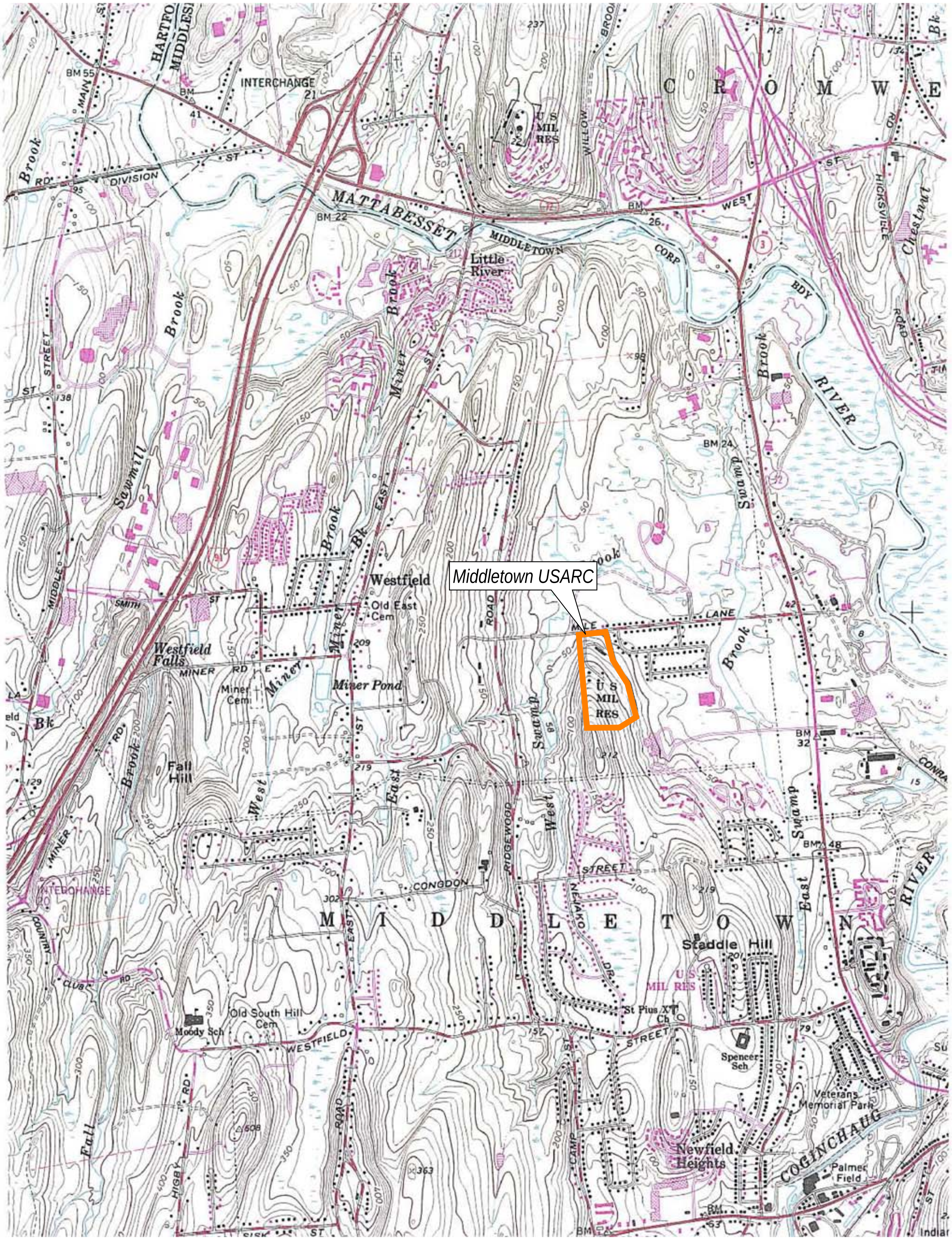

FIGURE 6
1984 USGS 7.5 Minute Topographic Map, Middletown
Phase I ECP Report
Middletown U.S. Army Reserve Center

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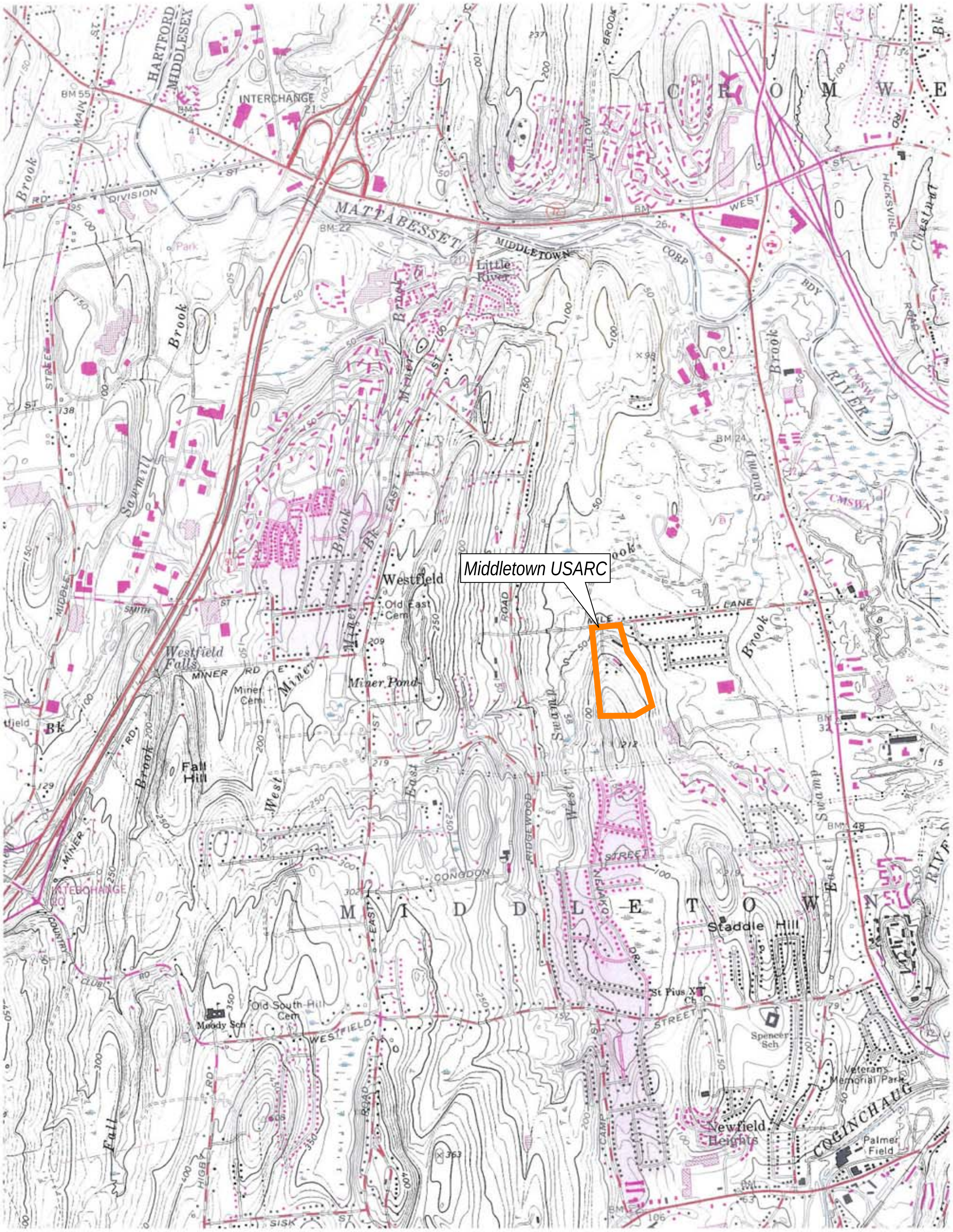

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Not To Scale

FIGURE 7
1992 USGS 7.5 Minute Topographic Map, Middletown
Phase I ECP Report
Middletown U.S. Army Reserve Center

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North

FIGURE 8
1989 Aerial Photo
Phase I ECP Report
Middletown U.S. Army Reserve Center

North

FIGURE 9
1995 Aerial Photo
Phase I ECP Report
Middletown U.S. Army Reserve Center

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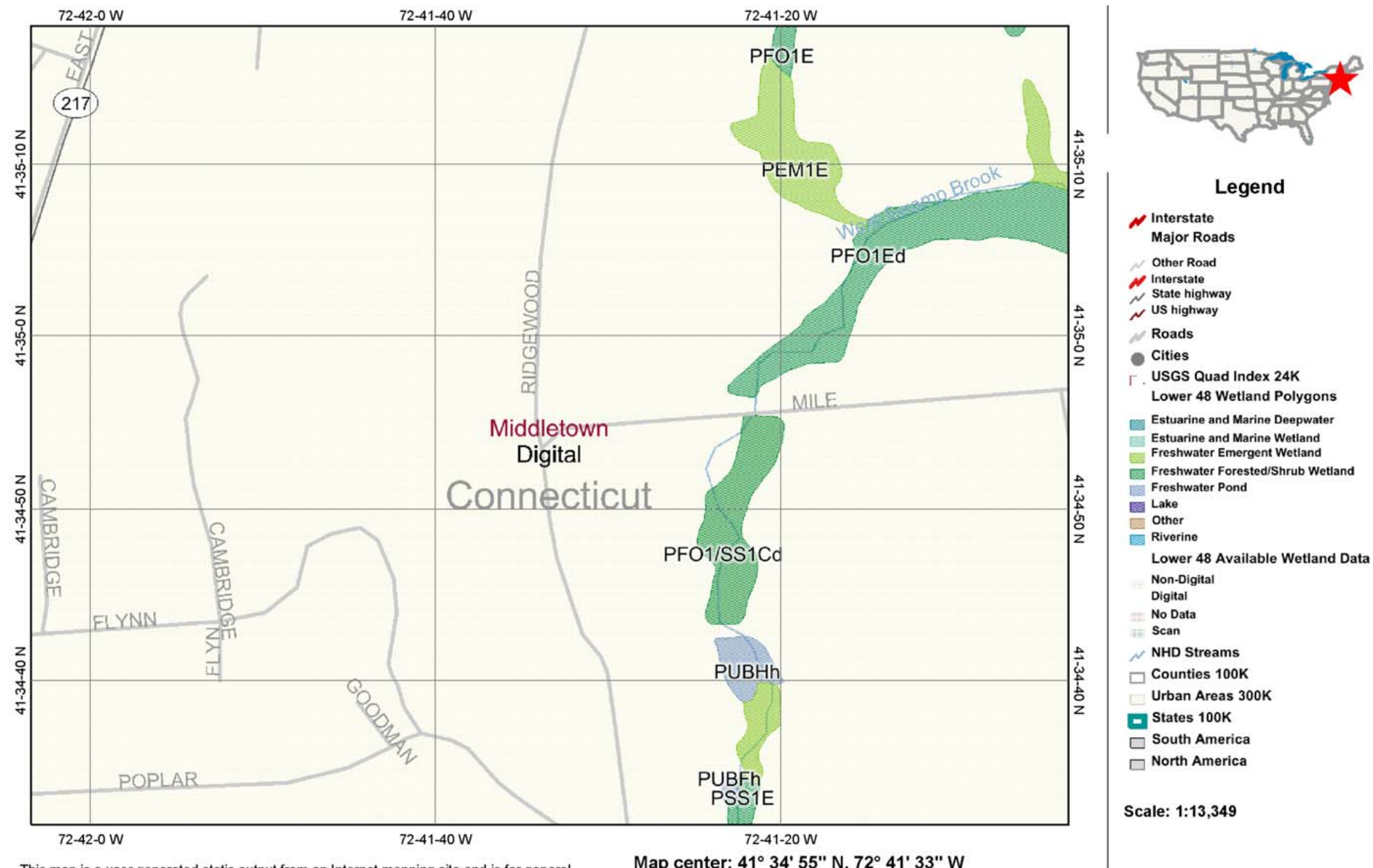

This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.

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FIGURE 10
Wetland Map
Phase I ECP Report
Middletown U.S. Army Reserve Center

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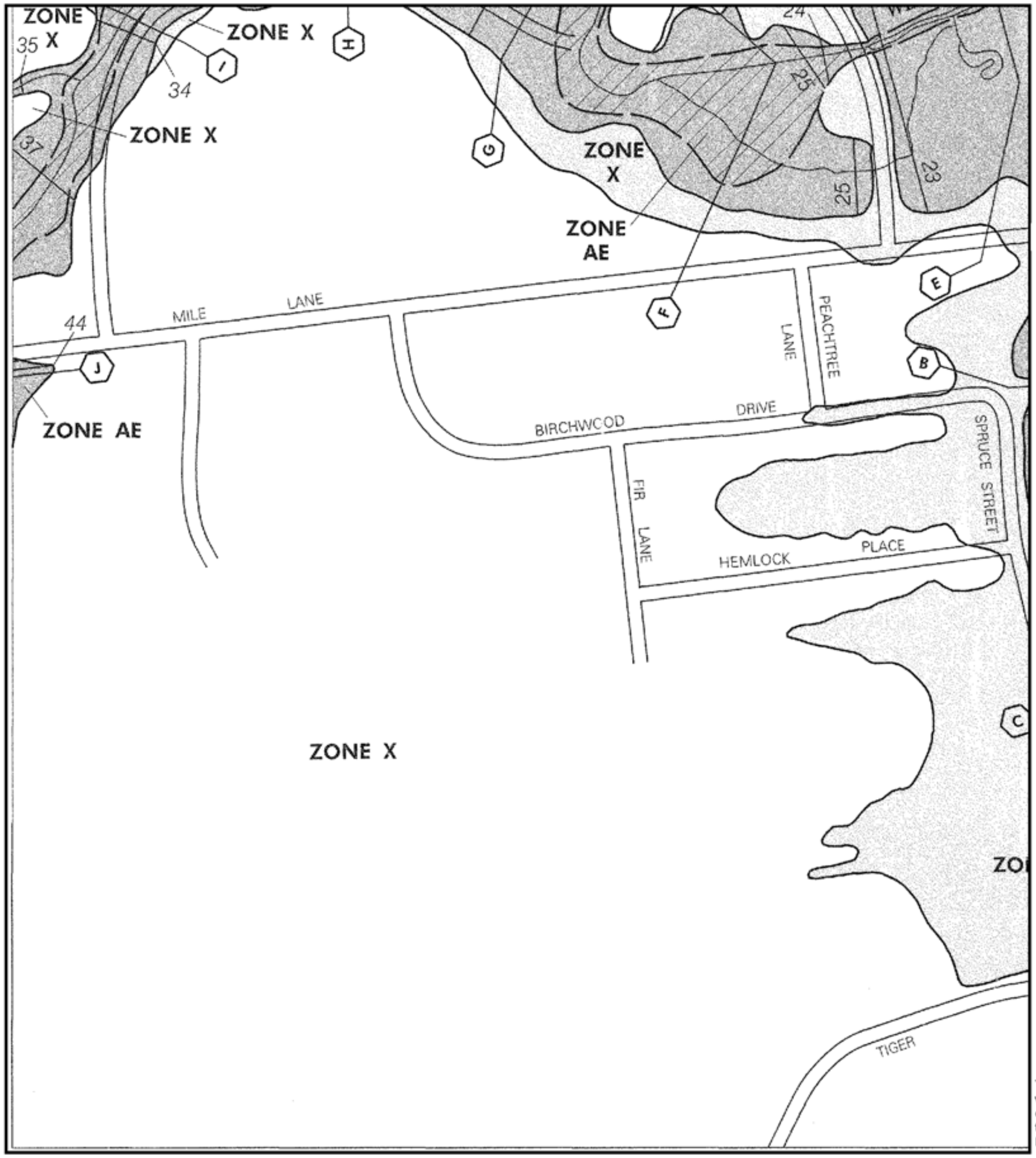

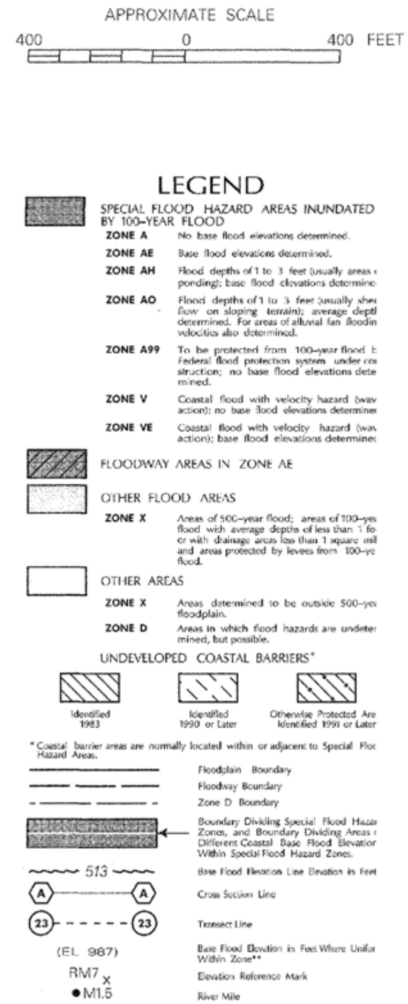

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

North

FIGURE 11
Flood Plain Map
Phase I ECP Report
Middletown U.S. Army Reserve Center

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Appendix B

Site Reconnaissance Photographs

APPENDIX B

Site Reconnaissance Photographs

1. Middletown USARC Building—Northeast Side

2. Middletown USARC Building—Southwest Side

3. Privately Owned Vehicle Parking Area

4. Main Entrance with Arms Vault on Left

5. Main Office Area

6. Drill Area

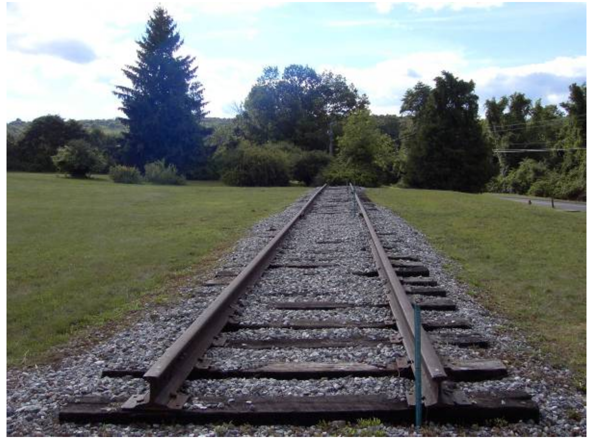
7. Kitchen (no longer in use) Located in the Drill Area

8. Former Classroom

9. Equipment Storage Area

10. Boiler Room

11. Septic Tank/Leach Field Area with Railroad Section in Background



12.Railroad Section

13. Acid Neutralization Building Foundation—East Side

14. Acid Neutralization Building Foundation—West Side

15. General Maintenance Building Foundation

16. Possible Acid Neutralization Pit

17. Barracks/Reserve Center Foundation

18. Former Nike Missile Launch Pad Site

19. Rail Timbers Disposed of in South Portion of the Property.

20. View along the Rear of Property along the South Side

Appendix C

Property Acquisition Documents and Chain of Title Report

5) Total Facility Assessment Report

An August 15, 1996 Total Facility Assessment Report, prepared by the Devens Facilities Engineering Team contains a series of photographs of their site investigation. In the report, the Missile Test and Assembly Building is referred to as the organizational maintenance shop (OMS) Building and the Warheading Building is referred to as Cold Storage Building. Three 55-gallon drums of unknown content are apparent in a photograph of the exterior of the Missile Test and Assembly Building. The drums are located next to the northeast corner of the building. Two of the drums appear to be on a secondary containment pallet intended to prevent potential spillage from reaching the ground surface. However, no drums or evidence of drum storage, such as staining, were observed during the site visit in the subject area. The report indicated that no vehicle maintenance was performed in the building, which at the time was used for unspecified storage..

6) Relevant Information from Chain of Title Review

An informal chain-of-title for the USARC property is summarized below based on review of the Middletown City Clerk records on August 4, 1998.

TABLE 1
SUMMARY OF INFORMAL CHAIN-OF-TITLE

From	*To*	*Volume*	*Page*	*Date*
Irving Sherman	United States of America	269	132	9/22/55
Irving Sherman	United States of America	269	133	9/22/55
Paul A. Gilbert	United States of America	269	134	9/22/55

7) General Site Information

Based on DTC's review of the 1934 and 1951 aerial photographs and the Middletown Clerk records, the site appears to have been farmland prior to development as a Nike site circa 1955. The former Nike surface-to-air missile battery HA-48 was decommissioned in 1968 according to the May 1997 Final Historic Inventory Survey of Army Reserve Facilities Throughout New England Under the 94th Regional Support command. The site was transferred to the USARC circa 1970.

A National Environmental Policy Act (NEPA) Screen was conducted to identify the 100 year and 500 year floodplain, floodways, historic districts, archaeological and Indian burial sites and threatened or endangered species which may be impacted during the proposed demolition of the site buildings. A NEPA Screen map is attached as Exhibit C-1. The subject site is located outside the 100- and 500-year flood plain as shown in the Flood Insurance Rate Map for the Town of Middletown, Connecticut. The State of Connecticut Historical Commission records indicated that the proposed demolition activities at the site would not impact any historic, architectural, or archaeological resources listed or eligible for the National Register of Historic Places. No endangered or threatened species are recorded in the project area based on review of

Source

VOL 269 PAGE 132
Tract No. A-106

VOL 269 PAGE 133
Tract No. A-1063
or
A-106B

VOL 269 PAGE 134
Tract No. A-107

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Report. A copy of this
Report Has been Requested

Appendix D

Previous Environmental Site Assessment Reports

FINAL REPORT

INVESTIGATION OF FORMER NIKE MISSILE SITES FOR POTENTIAL TOXIC AND HAZARDOUS WASTE CONTAMINATION

[redacted]

Prepared for:
DEPARTMENT OF THE ARMY
HUNTSVILLE DIVISION, CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA
CONTRACT #DACA87 [illegible]

Prepared by:
LAW ENGINEERING TESTING COMPANY
LES-GOVERNMENT SERVICES DIVISION
ATLANTA, GEORGIA
LEGS JOB NO. 601

March, 1986

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VOLUME II

APPENDIX C - SAMPLING AND ANALYSIS PLAN

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APPENDIX E - HEALTH AND SAFETY PLAN

LIST OF ACRONYMS AND ABBREVIATIONS

ARAACOM	U.S. Army Anti-Aircraft Command
ARADCOM	U.S. Army Air Defense Command
ASTM	American Society for Testing and Materials
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Continuous Flight Auger
COE	U.S. Army Corps of Engineers
CONAD	Continental Air Defense Command
CONUS	Continental United States
DERP	Defense Environmental Restoration Program
DOD	Department of Defense
EPA (US)	United States Environmental Protection Agency
gal	Gallons
HSA	Hollow Stem Auger
ICBM	Intercontinental Ballistic Missile
IFC	Integrated Fire Control
IRP	Installation Restoration Program
lb	Pounds
ml	Milliliter
MR	Mud Rotary
NATO	North Atlantic Treaty Organization
NORAD	North American Air Defense Command
OSHA	Occupational Safety & Health Administration
OVA	Organic Vapor Analyzer
PDP	Preliminary Determination Phase
POL	Petroleum Oils & Lubricant (Barrels) for disposal
PVC	Polyvinyl Chloride
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
SCBA	Self Contained Breathing Apparatus
VOA	Volatile Organic Analysis
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency

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SECTION 1.0 - EXECUTIVE SUMMARY

As part of the Department of Defense's (DOD) Defense Environmental Restoration Program (DERP), this investigation was authorized to determine the potential for toxic or hazardous contamination applicable to all former NIKE Missile Sites located throughout the Continental United States. Phase I of this study provided for specific literature reviews and related data gathering functions to provide general information about potential NIKE site contamination. This report addresses these issues. A summary of the pertinent information is presented as follows:

1. NIKE Ajax and NIKE Hercules missiles were deployed by the United States Army throughout the Continental United States to protect major metropolitan areas and strategic military installations from aerial attack. The NIKE system was generally in place in the time frame encompassing the early 1950s to the mid 1970s.

2. A NIKE site typically consisted of two separate and distinct operating units. These included the Launcher Area and the Integrated Fire Control (IFC) Area. The Launcher Area was generally located on approximately 40-60 acres of land although each site could vary significantly in size and shape. The IFC Area, generally ranged in size from 10-50 acres. The barracks facilities were either incorporated as part of the Launcher Area or the IFC Area, or a third separate and distinct Facility Area was constructed.

3. Maintenance of the missile batteries in a combat ready status required the storage, handling and disposal of missile components as well as solvents, fuels, hydraulic fluids, paints, and other materials required for support functions. Normal operating practices at NIKE batteries in the conduct of these functions possibly resulted in

contamination of the subsurface soil and/or groundwater regime.

4. Virtually all of the information concerning the potential for contamination at NIKE Sites came from interpretation of Operating Manuals and resulting questions directed to past NIKE site operators and the general discussion with these operators which followed in the interview phase of this investigation.

5. Potential contamination source areas at NIKE Sites included:

LAUNCHER AREA

- Missile Assembly Drainage and Seepage Systems
- Diesel and Fuel Oil Storage Tanks
- Magazine Sump Seepage System
- Secluded Areas Adapted to Unofficial Dumping
- Warheading/Fueling Area Drainage Systems
- Motor Pool (when present)
- Septic Systems (when present)

INTEGRATED FIRE CONTROL (IFC) AREA

- Motor Pool (when present)
- Septics Systems (when present)
- Diesel, Fuel Oil, and Gasoline Storage Tanks
- Secluded Areas Adapted to Unofficial Dumping

Of these two Areas, the Launcher Area had the greater potential for contamination.

6. Operating practices producing a potential for contamination at NIKE Sites included:

LAUNCHER AREA

- Missile Assembly and Disassembly
- Missile Fueling and Warheading
- Missile Maintenance and Testing
- General Launcher and Magazine Maintenance

INTEGRATED FIRE CONTROL (IFC) AREA

- Fire Control Operations Maintenance
- Vehicle Maintenance

GENERAL OPERATIONS

- General Facilities Maintenance
- Utility Service
- Deactivation

7. The Master Contaminants List which consists of the potential contaminants of former NIKE Sites that should be investigated for the NIKE Preliminary Determination phase (Phase II of this investigation program) includes:

- Benzene
- Carbon Tetrachloride
- Chromium
- Petroleum Hydrocarbons
- Lead
- Perchlorethylene
- Toluene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloroethene

SECTION 2.0 - INTRODUCTION

The Department of the Defense (DOD), conducts a number of industrial processes and manufacturing operations that are similar to private industry. In the late 1970's, DOD became aware of the negative impacts of what were previously considered acceptable disposal practices of waste materials associated with these processes and operations. In response to that knowledge, programs were developed between 1975 and 1978 by each service component to identify and assess potential contamination on active military installations. Authority to address problems of other than active installations was lacking since funds could not be spent on sites not owned by DOD.

The passage of the 1984 Defense Appropriations Act corrected this problem. Specific language in the Act directed DOD to extend its efforts to include sites formerly used by DOD and broaden the definition of "hazard" to include structures and debris which were to be abandoned or had been abandoned upon termination of its military use.

The Act directed that the Secretary of Defense assume overall management of the program to assure consistent approach and adequate resource allocation. A Defense Environmental Restoration Account was established and provided the resources for the Defense Environmental Restoration Program (DERP). The work performed relative to this study falls within the jurisdiction of the DERP program.

The objective of this investigation addresses the potential for toxic or hazardous contamination applicable to all former NIKE Missile Sites located throughout the Continental United States (CONUS). Contamination includes hazardous or toxic substances formed in ground water, surface water and soil with contaminants specified by regulatory criteria. To fulfill this objective, the work elements described in the following paragraphs were performed in accordance with the provisions of our contract. Discussion of the manner in which each work element was conducted as well as how it is reported in this document is also presented.

1) **Obtain an updated list of the CONUS NIKE sites.** This list is presented in Appendix A in the form of individual site reports, entitled "NIKE Site Listing Forms", which describe pertinent known information about each site. This data was gathered during the summer of 1985 and is not considered current beyond that date. Most of the information came from site reports on file at the Corps of Engineers, Huntsville Division offices and from data presented by the Corps of Engineers District offices. The initial working list of CONUS NIKE sites came from the report "Historical Overview of the NIKE Missile System" reference 1, Appendix B-1.

2) **Identify the primary agencies involved with the command at the time of operations of the site and identify the responsibilities of the primary agencies involved, relative to the operations of various NIKE Missile systems.** This information was gathered through interviews with site operators and basically substantiated the information presented in reference 1. Section 4.0 of this report addresses this subject.

3) **Conduct an archive search to obtain copies of the active NIKE site operating procedures, technical manuals, training manuals and field manuals, and develop a summary of information relative to activities which may have caused contamination.** Contact was made with the NIKE Project Management Office at Redstone Arsenal for specific input regarding the manuals and procedures which would give information relative to activities which may have caused contamination. Specific manuals were recommended and have

been reviewed in the context of this investigation. This information is presented in Report Sections 6.0 and 7.0.

4) **Meet with three different previous NIKE Site operators and obtain information on site operating practices. Any information relative to site contamination shall be recorded.** This task was carried out with the assistance of the NIKE Project Management office at Redstone Arsenal and included a trip to Ft. Bliss, Texas where the interviews were conducted. The information gathered in this interview process has been incorporated into the basic findings and conclusions of this report.

5) **Review the four USATHAMA reports listed and make reference to the contamination or waste associated with the particular sites.** This review was conducted and information has been used compiling the results of this report. A significant amount of background information has been incorporated from reference 1 to permit proper understanding of the history and operation of the NIKE program.

6) **Determine the location of the "As-Built" drawings for all sites and specify their locations in the report.** Each of the Corps of Engineers District offices was contacted regarding the location of the "As-Built" drawings for NIKE sites under their jurisdiction. A few of the districts reported that "As-Built" drawings were on file at the District office that had jurisdiction over a particular site. In most cases however, the "As-Built" drawings cannot be located. Information regarding the location of the "As-Built" drawings is recorded on the NIKE Site Listing Form for each site given in Appendix A.

7) **Obtain and review the deactivation plans for the NIKE Systems and provide information concerning possible contamination.** Each of the Corps of Engineers District

offices as well as the Redstone Arsenal NIKE Project Management Office was contacted regarding the location of deactivation plans. In no case was it possible to locate any site specific deactivation plans. Two generic deactivation procedures documents were located at the Redstone Arsenal NIKE Project Management Office. These were reviewed for practices concerning possible contamination and the finding were incorporated in the general findings of this report. These documents are listed as part of the reference material.

8) **List substances that may act as possible sources of contamination, such as: solvents, starting fluid mixtures (UDMH), fuels, hydraulic fluids, paints, etc. The list should also include the contaminants from each source. Any substances associated with operations, maintenance or deactivation of the NIKE site should be addressed. The substances must have been used in quantities that justifies evaluation as a contamination source.** The findings of the data gathering process as outlined in paragraphs 1-7 led to the conclusion of the listed substances that may act as possible sources of contamination. The findings as determined by this investigative process are discussed in Section 8.0.

9) **Identify any disposal, maintenance or operating practices that may have caused contamination.** The data gathering process described above also provided information that responded to that requested by this contract task. The results are presented in Section 7.0.

10) **Survey the research information and identify potential contamination source areas within the general NIKE sites.** The data gathering process described above yielded the pertinent information. The results are presented in Section 6.0.

11) **Based on the data developed from tasks 1-10, develop a Generic Sampling and Analysis Plan conforming to the requirements of Contract Annex A. Further, a Quality Control and Quality Assurance (QA/QC) Plan shall be developed along with the Sampling and Analysis Plan.** The Generic Sampling and Analysis Plan and the Quality Control and Quality Assurance Plan as specified are presented in the Appendix C of this Report. As a corollary to the Sampling and Analysis Plan, a Generic Well Installation Plan has also been developed and is presented in Appendix D of this report.

12) **Prepare a Safety Plan that meets the requirements of Annex C of the contract.** The Generic Safety Plan as required is presented in Appendix E of this Report.

Work items (1) through (12) constitute Phase I of the NIKE missile site study of potential toxic or hazardous contamination, which is the subject of this report. Phase II constitutes a Sampling and Analysis field investigation of 10 Representative NIKE Sites which will be addressed in subsequent Reports.

Subsequent sections of this report give pertinent background data regarding the NIKE missile program identify potential contamination source areas within the general NIKE site, describe disposal, maintenance or operating practices that may have caused contamination, and present a list of substances that may have acted as possible sources of contamination including the contaminants that result from these sources.

SECTION 3.0 - NIKE PROGRAM BACKGROUND

The main source of background material regarding the history of the NIKE program was included in reference 1. Portions of this reference are summarized herein to provide proper background information regarding the NIKE program.

NIKE Ajax and NIKE Hercules missiles were deployed by the United States Army throughout the Continental United States to protect major metropolitan areas and strategic military installations from aerial attack. The NIKE system was generally in place in the time frame encompassing the early 1950s to the mid 1970s. Maintenance of the missile batteries in a combat ready status required the storage, handling and disposal of missile components as well as solvents, fuels, hydraulic fluids, paints, and other materials required for support functions.

Initial development studies began on the system right after the end of World War II, with the objective of forming an air defense system capable of engaging high speed maneuverable targets at greater ranges than the conventional artillery available at that time. The research and development program for the NIKE system became accelerated in the early 1950s with initial guided missiles becoming operational for the first time in 1954 when combat ready missiles (known as NIKE Ajax) were deployed. Conventional anti-aircraft gun units were outnumbered by NIKE Ajax units by December 1956, and the conversion to guided missiles was completed by mid 1958.

During the period of its operational life, the NIKE Ajax system remained essentially unchanged. However, a second generation NIKE system, to be named NIKE Hercules, was under development by the mid 1950s. NIKE Ajax batteries were similar in design and construction with all units having similar operational components. Minimal field changes were made during the operational life of the NIKE/Ajax system. These were limited to minor equipment modifications to improve operational efficiency. Beginning in late 1958, selected NIKE Ajax batteries began conversion to the more advanced NIKE/Hercules system. However, it was not until early 1964, that the last NIKE Ajax battery was deactivated and the entire operational system deployed the NIKE Hercules missile. The primary role of the NIKE Hercules system was its ability to attack high speed, high-flying aircraft formations with a single nuclear warhead. Another significant advancement concerned the nature of the rocket fuels. The NIKE Ajax system used liquid fuels which were highly toxic and had to be handled with extreme care. The NIKE Hercules missiles made more use of solid fuel which significantly simplified the fueling and maintenance operations of the missile system. The initial design guidelines for the NIKE Hercules missile provided for maximum use of proven components from the NIKE Ajax program and stipulated that both missiles must be compatible with all sets of ground and launching equipment. Therefore, a minimal amount of modification of the battery units was required to convert from the NIKE Ajax to the NIKE/Hercules system.

During its term of service in the field, the NIKE Hercules system underwent numerous design modifications. As originally conceived, the system was known as basic Hercules. However, several improvement programs were subsequently implemented to keep the system up to date. The design modifications primarily provided improved target tracking, guidance, and interception capabilities by modifying or replacing radar and electronic equipment. However, these modifications to the missile system did not produce any significant change in the battery configuration.

Not all Hercules batteries were retro-fitted for the new equipment , because of budget limitations. Guidelines provided for retro-fitting of certain batteries within any particular defense area, based on the number of batteries located in that defense area. Hence, the field deployment within a single defense area in the early 1960s may have included Ajax, basic Hercules, and improved Hercules batteries.

NIKE/Zeus, the third generation missile of the NIKE program, was the first missile developed in the United States that was designed to defend against Intercontinental Ballistic Missiles (ICBM). However, NIKE Zeus was never approved for production or deployment as a tactical system.

In 1962, the Army began transferring operation of certain NIKE batteries to National Guard Units. Shortly thereafter, deactivation of NIKE batteries began. By 1970, the Army had deactivated most CONUS NIKE sites. National Guard Units continued to maintain a few sites until the late 1970s. Some NIKE equipment is still retained in Ft. Bliss for the purpose of training troops from other North Atlantic Treaty Organization (NATO) countries that still incorporate NIKE missiles in their defense programs.

SECTION 4.0 - NIKE PROGRAM MILITARY ORGANIZATION

4.1 NATIONAL AIR DEFENSE ORGANIZATION

Background information for this Section was taken directly from reference 1 and was substantiated during the site operator interviews, with minor modifications. The reference states that the development of a missile-based air defense system (NIKE) was paralleled by changes in command structure in the defense organization, beginning in July 1950. At that time the Army placed all artillery units with continental air defense missions under the newly organized U.S. Army Anti-Aircraft Command (ARAACOM) located at Ent Air Force Base in Colorado Springs, Colorado. The installation of NIKE Ajax batteries beginning in 1953, led to further re-organization of the Continental Air Defense structure and the Army's Anti-Aircraft missions and organization. On September 1, 1954, ARAACOM and corresponding elements in the U.S. Air Force and the U.S. Navy were combined to form the Continental Air Defense Command (CONAD) at Colorado Springs under the direction of the Joint Chiefs of Staff. In 1957, the Army's air defense responsibility within CONAD was defined as point air defense by missiles fired from the ground to aerial targets not more than 100 miles away. Point defense was to include "Geographical areas, cities, and vital installations that could be defended by missile units which received their guidance information from radars near launching site" and also was to include the responsibility of a ground commander for air protection of his forces. To represent this expanded, all missile role more clearly, ARAACOM was re-designated the U.S. Army Air Defense Command (ARADCOM) on March 21, 1957.

Further development on a national scale occurred in September 1957, when the North American Air Defense Command (NORAD) was formed to combine air defense capabilities of Canada and United

States under a one Commander in Chief, who also headed CONAD. Like CONAD, NORAD elements in the United Stated report directly to the Joint Chiefs of Staff. All Army ARADCOM units were placed under the operational control of NORAD. ARADCOM continued in this basic configuration until 1975, at which time the NIKE missile program had essentially been disbanded in CONUS.

4.2 NIKE SYSTEM ORGANIZATION

The basic operational unit of a NIKE site was the Battery. The Battery was commanded by an Army Captain. On a specific site the Battery was sub-divided into six elements. These are listed below, followed by a brief mission statement:

1) Headquarters Section: The headquarters section was responsible for the operational and administrative control of personnel and equipment.

2) Communications Section: The communications section was responsible for installing and maintaining non-commercial communication nets and operating the commercial communication nets within the Battery.

3) Fire Control Platoon: The fire control platoon was responsible for the operation and maintenance of fire control equipment in the Integrated Fire Control (IFC) area.

4) Launching Platoon: The launching platoon had administrative control over one launching platoon headquarters and three launching sections, which are described in the next paragraphs.

5) Launching Platoon Headquarters: The launching platoon headquarters was responsible for the operation and training of three launching sections. It contained personnel who assembled, tested and performed organizational maintenance

on the NIKE missile and maintained the rounds at the launching section.

6) Launching Section: The three launching sections were responsible for the preparation of the missile and booster for firing after they were delivered to the launching section from the assembly and test area. In addition, they performed the routine non-technical tests, checks, adjustments, and organizational maintenance.

The next organizational unit above the Battery was the Battalion. Generally, there were four Batteries in each Battalion. The Battalion was typically commanded by a Lieutenant Colonel. The Battalion generally consisted of a headquarters and headquarters Battery, four Firing Batteries (described above), and a Medical Section. In addition, any motorpool maintenance activities other than the most routine, were performed at the Battalion level.

The Battalion headquarters and headquarters Battery comprised the following 7 elements:

1) Battery Headquarters
2) Battalion Administration Supply Section
3) Operation and Intelligence Section
4) Battalion Motor and Maintenance Section
5) Communications Section
6) Radar Section
7) Assembly and Service Section

The Assembly and Service Section was a team of technical experts who supervised and assisted in the assembly, testing and performance of organizational maintenance on missiles and boosters.

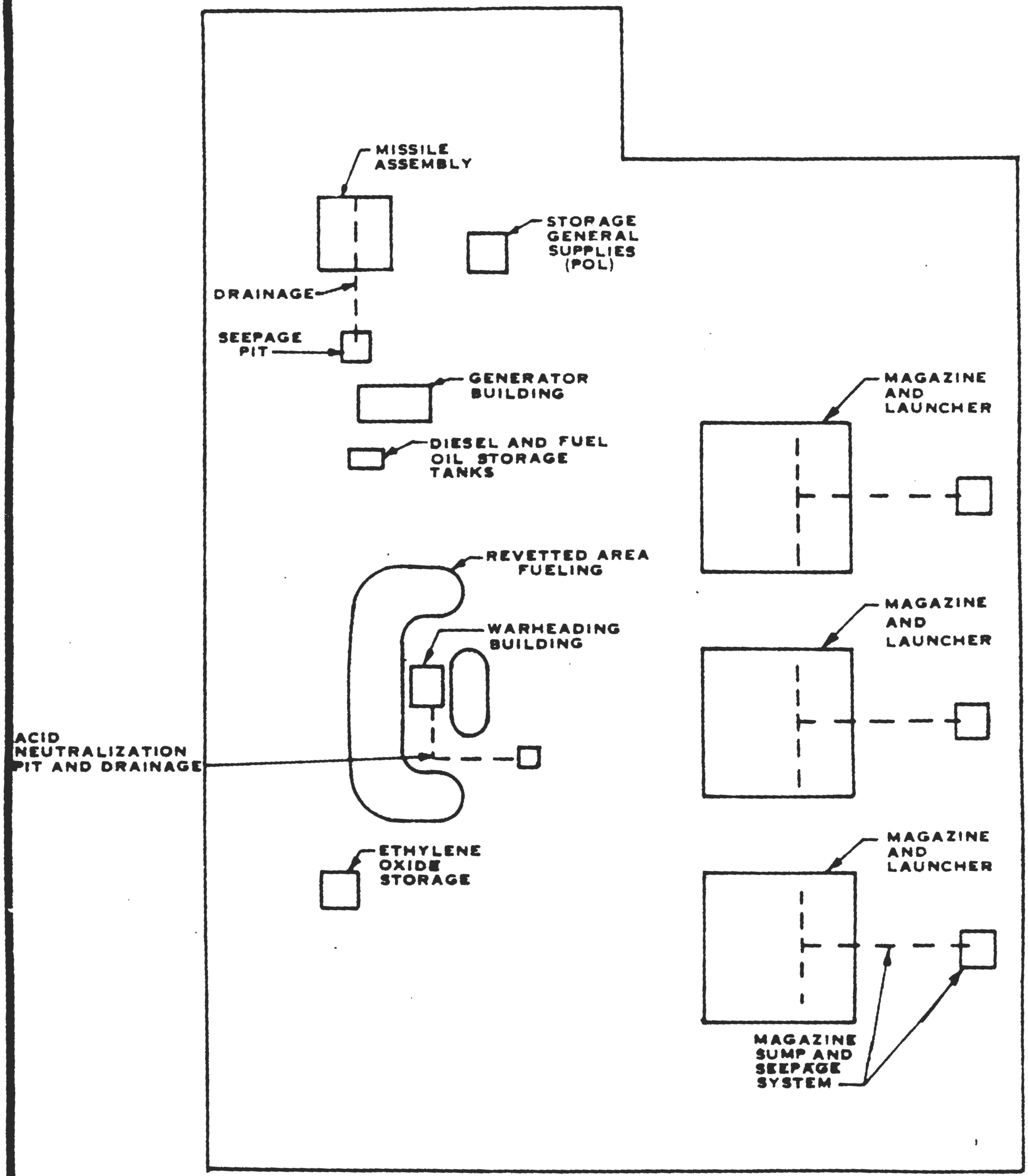
The organizational unit above the Battalion level consisted of either a Group or a Brigade. This level was usually commanded by either a Colonel or a Brigadier General. A Group had only NIKE Battalions reporting to it, whereas a Brigade could have other military entities reporting to it besides NIKE Battalions. The Group or Brigade level was organized into United States Regions. The Region was usually commanded by a Brigadier General or a Major General. The Region could have a number of different types of military units reporting to it other than NIKE Groups. As the number of United States military units increased or decreased, the number of regions also changed. The maximum number of regions that constituted the division of the United States military organization was six. The Regions reported to ARADCOM at Ent Air Force Base in Colorado. This organizational structure basically functioned during the period of the maximum activity of the NIKE program during the mid 1960s. As was previously stated, ARADCOM was disbanded in 1975.

SECTION 5.0 - NIKE BATTERY DESCRIPTION

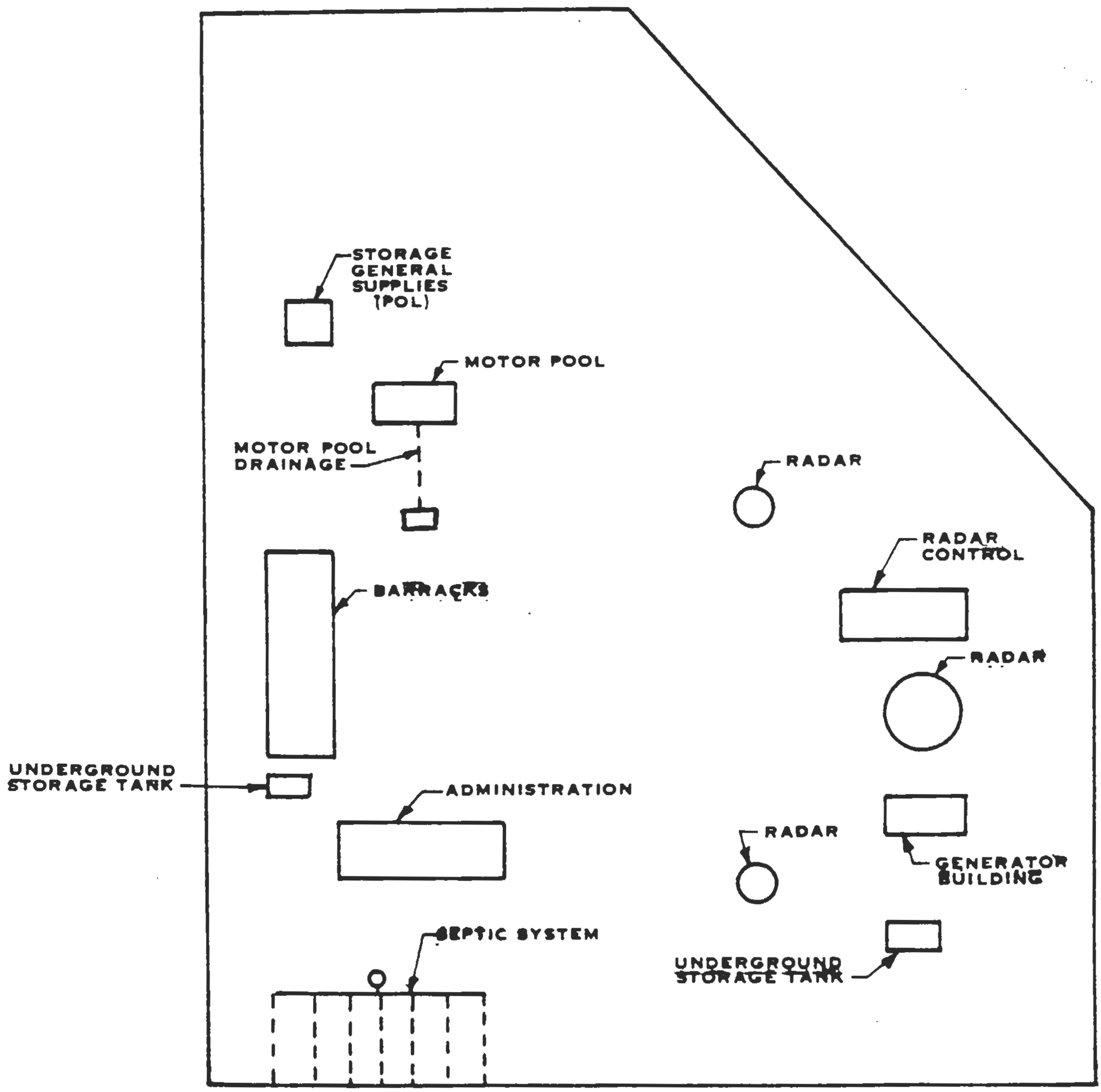
5.1 BATTERY LAYOUT

A NIKE site typically consisted of two separate and distinct operating units. These included the Launcher Area and the Integrated Fire Control (IFC) Area. The Launcher Area was generally located on approximately 40-60 acres of land although each site could vary significantly in size and shape. The IFC Area, generally ranged in size from 10-50 acres. The Barracks facilities were either incorporated as part of the Launcher Area or the IFC Area, or a third separate and distinct Facility Area was constructed. The Launcher Area and the IFC Area would generally be located 1-2 miles apart to facilitate necessary distance and equipment restrictions that involved the successful interaction of the two Areas.

The layout of structures within each Area appears to have been site specific, although each site appeared to have certain structures in common. Figures 1 and 2 illustrate a generalized NIKE Launcher Area and a generalized NIKE IFC Area. These Figures illustrate the structural units that appeared to be common to most Batteries although their general location to each other could vary significantly. For the Launcher Area, the key structural units include the missile assembly building, general storage and supply buildings, the generator building, the warhead building, and the three magazine (Missile Storage)/launch units. The IFC Area generally included the radar units, the generator building, general storage and supply buildings, and in most cases, the motorpool. At some sites, the motorpool could have been located at the Launcher Area. In many cases, the IFC Area also had facilities for administration and barracks. Generally, the administration and barracks areas were located at the IFC Area, however, on occasion they were located at the Launcher Area or on a separate parcel of land. These sites also generally



GENERALIZED NIKE SITE CONTRACT DACA 87-85-0104	LAW ENVIRONMENTAL SERVICES MARIETTA, GEORGIA	LAUNCHER AREA FIGURE



GENERALIZED NIKE SITE CONTRACT DACA 87-[illegible]	LAW ENVIRONMENTAL SERVICES MARI[illegible]RGIA	INTERGRATED FIRE CONTROL AREA

FIGURE 1

included a number of forms of waste disposal including sump and draining systems, seepage pits, septic tanks with infiltration wells for liquid waste disposal, and occasionally on-site landfills.

5.2 GENERAL UNIT OPERATIONS

5.2.1 Launcher Area

The Launcher Area of a NIKE site was the location where the missiles and warheads were assembled, maintained, and prepared for firing. The missiles arrived at the site disassembled into 13 specific components. All operations necessary to make the missiles flight ready were then conducted in specific locations in the Launcher Area. These operations as they applied to contamination are discussed in Sections 6.0 and 7.0. In general, routine maintenance and checking procedures were performed on the missile at the Launcher Area. However, on a periodic basis missiles were returned to the Battalion support shop for more detailed maintenance and service checking. It is estimated that approximately 30 missiles per year were sent from the Battery Launch Area to the Battalion support shop. It was also common practice to randomly select certain missiles to be returned to one of the three national Depot areas for more complete maintenance and service checking operations. The national Depots were located at Letterkenny, Pennsylvania; Tooele, Utah; and Pueblo, Colorado.

Approximately 10 missiles per year were sent from a particular Battalion to Depot. Any shipping of the missile required it to be totally disassembled into its 13 component parts, packed in its original crates, and shipped. This was done at the Battery missile assembly building. It was also routine practice for the personnel of a particular Battery to be sent to McGregor Range in southern New Mexico for test firing practice, about once a year.

When this occurred, the radar units were disassembled at the Battery location for major maintenance and service checking.

5.2.2 Integrated Fire Control (IFC) Area

The IFC Area at a site contained all the radar, guidance, electronic, and communications equipment needed to identify incoming targets, launch missiles, and direct missiles in flight. These operations as they applied to contamination are discussed in Sections 6.0 and 7.0.

SECTION 6.0 - POTENTIAL CONTAMINATION SOURCE AREAS

Because of the nature of site operations, several individual source areas exist for potential contamination on former NIKE sites. Some source areas will be fairly consistent in the type and degree of contamination they present, whereas other sources will reflect site-specific variation.

Generalized site diagrams are presented in Figures 1 and 2. The intent of these Figures is primarily to indicate the major structural units for reference to areas that could have resulted in waste. As previously stated, the location of these units on any given site varied with the terrain and the general arrangement of facilities.

6.1 GENERAL - WASTE FLUID DISPOSAL

Probably the most significant general practice that occurred on site that could lead to contamination was the method of dealing with waste fluids. Standard operating practices dictated that waste fluids were to be accumulated in POL (Petroleum, Oils, Lubricants) Barrels which were periodically transported to official dumps. However waste fluids were reported to have been disposed of directly to the soil surface on occasion, rather than be transported to POL Barrels, resulting in localized contamination. The POL Barrel contents were also reported to have been occasionally dumped in a random "Unofficial" manner, creating concentrations of waste material in the soil both on-site or off-site. Locations of such dumps are predictable only by general site characteristics. This practice was discussed at length in the interviews and will be discussed further in this report relative to specific site units.

Specific site units that could have resulted in waste within the general vicinity of that unit are described in the next sections.

6.2 LAUNCHER AREA

Within the Launcher Area, three or four unit locations can be expected to have the highest probability of contamination. They were the following:

- Missile Assembly Drainage and Seepage Systems
- Diesel and Fuel Oil Storage Tanks
- Magazine Sump Seepage System
- Secluded Areas Adapted to Unofficial Dumping

Three additional areas present some possibility of contamination, however, to a less significant extent.

- Warheading/Fueling Area Drainage Systems
- Motorpool (when present)
- Septic Systems (when present)

6.2.1 Missile Assembly Drainage and Seepage Systems

The missile assembly building operations involved the use of various solvents, anticorrosion products, and paints as the missile was assembled and disassembled. The building was equipped with a full-length drainage system. Spilled or waste materials could be washed or dumped into this drainage system.

The drainage in most cases was a gravity-fed system. Waste materials were washed out of the building and into a small seepage system consisting of perforated tile or a seepage pit. The construction of the seepage system was highly variable and reflects features of the local terrain and soils. Porous soils would require a less elaborate system, since they would readily facilitate drainage. Pits were excavated and filled with gravel or other coarse fill. Seepage pits would tend to concentrate contaminants, when they were in use. It is also a possibility that seepage systems were abandoned and replaced on sites with long operating histories. Therefore, multiple pits could be present in the vicinity of each other.

6.2.2 Diesel and Fuel Oil Storage Tanks

A number of generators were reportedly used on NIKE sites and storage of diesel fuel was considerable. Tanks were also used to store fuel oil for heating purposes. These tanks were probably steel, but this could not be documented. It is probable that several tanks were present at each site, holding up to 5000 gallons each.

Tanks were usually buried underground. They probably leaked hydrocarbons to some degree into the surrounding soil, due to leakage at connections and possible spillage during transfer operations. Upon deactivation of the NIKE site, some quantities of fuel were abandoned on-site. In many cases, the tanks were never drained. It is now known that there is a high probability of tank deterioration and consequent leakage over time. According to industry standards, underground storage tanks have a working life of 10 to 15 years, and today, most of these ta have probably begun leaking because of corrosion. Under the U.S. Environmental Protection Agency program, leaking undergr storage tanks (LUST) are considered a priority hazardous w problem. Thus, buried tanks could present an existing proble

6.2.3 Magazine Sump Seepage Systems

Within the typical NIKE magazine, a floor drainage system permitted waste materials to be washed to a central sump located under the missile elevator shaft. This sump was equipped with a pump to deliver water and waste out of the magazine and into a seepage system. Solvents, paints, and hydraulic fluid were routinely washed to the sump.

As with the assembly building seepage system, this probably entailed drainage tiles and/or seepage pits. The volume of waste material handled by the magazine sump was probably greater than that of the assembly building, and seepage pits were more likely to be in use. The arrangement of the seepage system varied with the terrain and the arrangement of the magazines and launcher sections. It is also possible that on sites with steep terrain, sumps were simply pumped to a ravine or other watercourse.

6.2.4 Secluded Areas Adapted to "Unofficial" Dumping

Dumping of various wastes was reported as common at NIKE sites. The primary factor affecting the incidence of dumping was convenience. Certain authorized disposal routes were available to NIKE sites. However, utilization of these disposal routes varied from site to site. Solid waste could be delivered to municipal landfills, and the Army POL service was responsible for removing waste solvents, oils, and paints. When the landfill was not convenient or the POL was irregular about their pick-up, other methods were used to dispose of the waste. Rural sites were particularly prone to "unofficial" dumping. Dumping reportedly occurred both on-site and off-site. On-site dumps were secluded locations which would evade the attention of inspecting military officers. Lakes, ponds, swamps, and ravines were suited to this purpose. Off-site dumps could have made use of virtually any nearby ravine or water course. It was reported during the site operator interviews that "unofficial" dumping, including off-site locations was virtually a daily practice at some rural Battery locations. There was also use of "unofficial" dumps as well as public landfills at deactivation, as was learned in the site operator interviews.

6.2.5 Warheading/Fueling Area Drainage System

The potential for contamination in this area is considered to be less than that found in other areas. Liquid fuels were rarely spilled in quantities. The IRFNA (nitric acid), UDMH (dimethyl hydrazine), and ethylene oxide were hazardous, volatile materials and were handled very carefully. It was very rare that quantities of these materials escaped accidentally. No persistent contamination would result from the spillage or leakage, due to the extreme reactivity of each.

Battery electrolyte was reportedly discarded in this area as well. Modest amounts of lead may have been introduced as a result of this operation. However, it is likely that other sources of lead, such as paint, were of much greater magnitude. Sulfates and nitrates in the warheading/fueling area would be insignificant in the concentrations at which they would occur.

6.2.6 Motor Pool

NIKE Site motor pools were not extensive. Most motor pool operations were performed at the Battalion level. However, some minor contamination by solvents, fuels, and lubricants could have occurred. Motor pools as a source of contamination are discussed in greater detail under Section 6.3.1.

6.2.7 Septic Systems

When barracks were sited on the launcher area, a septic system of significant size was required. Urban and suburban NIKE sites tied into municipal wastewater systems. However rural sites required a septic tank and leaching system. Barracks were more often sited at the IFC area, along with the battery administration and other facilities. Septic systems as a source of contamination are discussed in greater detail under Section 6.3.2.

6.3 INTEGRATED FIRE CONTROL (IFC) AREA

The IFC Area was less prone to chemical contamination than the Launcher Area. The diversity of chemicals was smaller, and the primary mission of the IFC radar operation, did not require significant chemical use. The main units of concern with regard to contamination at the IFC area were the following:

- Motor Pool
- Septic System
- Diesel, Fuel Oil, and Gasoline Storage Tanks
- Secluded Areas Adapted to Unofficial Dumping (Refer to discussion under Launch Control Area, Section 6.2.4)

6.3.1 Motor Pool

NIKE site motor pools did not involve extensive operations. Significant motor pool operations were performed at the Battalion location. However, some minor contamination by solvents, fuels, and lubricants could have occurred. In some cases, motor pools were equipped with floor drains and a drainage system similar to that of the assembly building in the Launcher Area. Thus, contamination by hydrocarbons and chlorinated hydrocarbon materials possibly occurred in the immediate vicinity of the motor pool.

6.3.2 Septic Systems

On rural sites, on-site waste water systems composed of septic tanks, distribution boxes, and leaching areas were used. The major function of these systems was handling sewage. However, on occasion, they may have been used to dispose of chemical products, and to that extent they present a potential source of contamination. In urban situations where sewage services were provided by the municipality, this source of contamination would not be present.

The materials most likely to have been disposed of via septic systems are paints and general domestic cleaning products. Of these, paints present the only threat of significant contamination in the form of oils and metallic pigments. Contamination in this instance would be spread over the area of the leaching field and within the septic tank.

Leaching fields vary in size according to the number of people using the facility and the type of soil at the site. Certain soil characteristics require much larger fields than others, depending on their ability to purify sewage product. On NIKE sites that were manned for many years, it is also likely that septic systems were occasionally replaced.

6.3.3 Diesel, Fuel Oil, and Gasoline Storage Tanks

Fuel storage tanks pose the greatest potential for contamination at the IFC areas. Tanks were present for diesel powered generators and trucks, heating oil, and gasoline for vehicles. As with the Launcher Area, large capacity diesel tanks served emergency power generators. Radar operations required considerable electricity and these generators were fairly large. Generators were routinely tested and leakage and spillage of fuel was common.

On most sites, depending on climatic condition, large volumes of fuel oil were consumed for heating purposes. Barracks and administration facilities were medium sized buildings capable of using thousands of gallons of fuel annually. Other facilities were also heated. Separate mess halls and recreational facilities were often present.

Some gasoline was stored at NIKE site motor pools, although not in quantities as extensive as those used for heating and generator operation.

As discussed earlier, underground storage tanks were reported to have leaked during NIKE site operations, however a greater source of possible contamination was material remaining in the tanks after deactivation. In many cases, fuels were not removed at the time of deactivation, and over a period of time, the likelihood of leaks from these tanks grows significantly. In all probability, most underground tanks at NIKE sites have begun to leak due to deterioration of the tanks.

SECTION 7.0 - POTENTIAL OPERATIONS PRODUCING CONTAMINATION

Virtually all chemical use at NIKE sites posed some potential for contamination. However, those chemicals used as missile fuels were controlled more strictly than maintenance and other operating materials because they were known to be toxic. In many cases, the missile fuels and igniters are strong oxidizers or reducers, and even incidental releases of them would not result in persistent contamination because of their reactivity. Other NIKE operations, including missile and launcher hydraulics, and maintenance operations, had considerably greater potential for causing contamination.

The following list of operating practices covers all major chemical uses that could potentially result in site contamination. The list is followed by a discussion of each operation. These discussions include mention of the chemicals and materials involved, as well as consideration of all factors affecting the potential for contamination.

Launcher Area

1) Missile Assembly and Disassembly
2) Missile Fueling and Warheading
3) Missile Maintenance and Testing
4) General Launcher and Magazine Maintenance

IFC Area

5) Fire Control Operations Maintenance
6) Vehicle Maintenance

General Operations

7) General Facilities Maintenance
8) Utility Service
9) Deactivation

7.1 LAUNCHER AREA

7.1.1 Missile Assembly and Disassembly

Missile assembly at NIKE sites was conducted in an assembly building located in the Launcher Area. All missile components were shipped to the sites in metal canisters and wooden fin crates. Minor chemical use occurred during assembly to remove anti-corrosion compounds, and lubricate and seal various parts. In the early phases of the NIKE program, some sanding and grinding of missile parts were conducted to repair defects. However, these operations were abandoned later in the program and defective parts were returned to the battalion or depot for repair, or return to the manufacturer.

Some painting was also conducted in the assembly building. This was done on an as-needed basis, and battalion commanders could choose to have missiles painted with optional camouflage.

Solvents used for missile preparation and cleaning included petroleum distillates (Stoddard Solvent, etc.), chlorinated solvents, and small use of alcohols. Waste solvent could be saved for POL Turn-In or, perhaps more often, was washed into drains that had a surface leaching system connected. Large quantities of certain solvents would evaporate during use. This particularly applies to the chlorinated solvents, such as carbon tetrachloride. The effects of surface leaching systems on contamination, depends greatly on the depth of the system, soil types, and local climate. Arid, sandy environments encourage further evaporation and rapid leaching of unevaporated materials. Finer grained soils (clays or silts) with routine rainfall discourage evaporation and decelerate leaching of some solvents.

Lubricants, sealants and paints are less adapted to disposal by drainage systems, although this was probably practiced for small quantities of left-over or waste material. Cans of waste and left-over material were dumped as solid waste which was delivered to local landfills. Rural sites may have frequently used unofficial dumps for disposal of these materials.

7.1.2 Missile Fueling and Warheading

Missile fueling and warheading was conducted in a revetted area separate from the assembly building. During the early period of the NIKE program, when conventional warheads were in service, this area was open. With the deployment of nuclear warheads, a Warheading Building was constructed and used for these operations.

In this area, missiles were fueled with the various materials and warheading of the missile was accomplished. The electrical batteries were installed here, as well as certain other delicate structural maintenance. Service and filling of the missile Accessory Power Supply was often conducted in this area as well.

Fueling with unsymmetrical dimethylhydrazine (UDMH), inhibited red fuming nitric acid (IRFNA), aniline, furfuryl alcohol, and ethylene oxide required care and presented fire and personnel safety hazards. Their use was governed by fairly strict protocol. Turn-In to depot for official disposal, as a mens of recycling to maintain fresh fuel on site, was probably strictly practiced. Environmental contamination was probably limited to incidental releases. With the exception of aniline and furfuryl alcohol, these materials were all reactive, and would dissipate rapidly in soil. Resulting compounds in most cases would be of low toxicity (nitrate, carbon dioxide, water, and ammonia). Reaction of UDMH and IRFNA could generate nitrosamine compounds. However, the likelihood of this occurring because of safety precautions, was very remote.

Ethylene oxide was used as a fuel for the Accessory Power Supply (APS) on the missile. It was maintained and used to test the system periodically. Ethylene oxide was routinely disposed of on-site via burning or dilution with water and subsequent surface dumping. As mentioned, ethylene oxide was used in moderate quantities and is reactive. Thus, there is virtually no possibility of persistent contamination.

As far as other fuels were concerned, the primary propellants were either hydrocarbons such as JP-4, or solid materials. JP-4 was used in the sustainer stage of the Ajax missiles and leakage could present some potential for contamination. All deployed Hercules missiles utilized sealed solid propellants with essentially no potential for release.

The fueling/warheading area had acid neutralization pits and general surface drainage. Spilled material occurring during "top-off" of fuel tanks was washed into the drainage system. Spilled battery electrolyte would also cause some light contamination from lead ions in the solution.

7.1.3 Missile Maintenance and Testing

Missile maintenance was conducted in four locations: the magazine, above ground at the launcher, the fueling area, and the assembly building. Refer to Figure 1 for the general location of these units. Where the maintenance took place depended on the specific operation. Simple procedures not involving the fuels or warhead or related electronics could be handled in the magazine. Other procedures required that the missile be taken above ground or to the fueling area. Major structural repairs required that the missile be defueled and returned to the assembly building.

Maintenance or repair of corrosion or hydraulic problems were most common. Certain missile parts were composed of magnesium or magnesium alloys and were very subject to corrosion. Hydraulic systems needed frequent checks and leakage was not uncommon.

Removal of corrosion from metal parts was conducted with at least three types of cleaners. Phosphoric acid in alcohol solution was used for aluminum parts, and alodine powder was used in water for certain minor cleaning. Most significant was the use of chromates in the form of chromium trioxide and sodium dichromate. Chromium trioxide is a solid material available in 5 pound containers. This was dissolved in water and used to wash magnesium and steel. Sodium dichromate is also a solid, but was dissolved in acids to form a pickling solution. Metal parts were dipped in this solution. These chromates may have been used in quantities large enough to cause contamination. Chromates are heavy metals, highly toxic, and in some cases are carcinogenic. Solutions used for decorrosion were undoubtedly washed into sumps and allowed to leach into the soil. It is also possible that significant dumping of chromium trioxide may have occurred during deactivation. This was discussed in the interviews.

Cleaning solvents were also used in missile maintenance. General cleaning and degreasing used Stoddard-type solvents (petroleum distillate), carbon tetrachloride, trichloroethane(s), perchlorethene, and trichloroethene, with minor use of alcohol and acetone. Chlorinated solvents are preferred degreasers and were heavily used. Solvents supplied by the depot were sometimes substituted and available excess quantities of certain solvents may have encouraged their use. Inventories of old solvents continued to be delivered to NIKE sites after the solvent was eliminated from military procurement. Perchlorethene was used on NIKE sites, but was previously unreported. This was disclosed in the interviews.

Painting of missile components also involved the use of chromium and another priority pollutant, lead. Zinc chromate paint was used to prime magnesium parts subsequent to cleaning. Lead-based paint was used for steel. Much of the paint was consumed. However, wastes resulted from the removal of old paint and unused paint remaining in cans. Paint is not well suited to drainage disposal, however, it is likely that some was eliminated in this manner. More often, leftover paint was disposed of via POL collection or "solid" waste dumping. Dumping may have been practiced on-site or off-site in unofficial dumps, or else community landfills may have been used.

Heavy metal contamination from paints may be a problem on NIKE sites. However, mobility in ground water is limited by the paint vehicle and the solubility of the metal ion. While hexavalent chrome from chromium trioxide is soluble, lead and chrome in paints is much less soluble. This somewhat decreases the probability of finding these metals in ground water samples even when they are present in soils.

Missile hydraulic fluid was replaced on a regular basis, and leakage, particularly of Ajax systems, was common. Used fluid that was drained from the missile may have been wasted to the sump, returned to POL, or dumped. Leakage was usually washed to the drainage sump. Unused hydraulic fluid also was disposed of, because once a can of fluid was opened, it was used immediately or disposed.

Aircraft turbine fluid was used for lubricating gears in the Missile Accessory Power Supply system. This fluid was probably synthetic tricresyl phosphate, which is a moderately toxic material. This was used in comparatively small quantities, however, some fluid probably did contaminate NIKE sites.

Hydraulic fluids and paints are composed primarily of petroleum oils. In instances where these were disposed of on-site, persistent contamination would occur.

The Accessory Power Supply and Hydraulic Pumping Unit provided critical power for control functions during the flight of a missile. Both systems were tested frequently, along with the electrical systems. Testing of the Accessory Power Supply sometimes utilized a "hot run" in which the ethylene oxide fuel was actually burned. Hot runs required that the missile be out of the magazine. Ethylene oxide was refueled after the run. As mentioned earlier, ethylene oxide waste was disposed of via burning or put into surface water. It is reactive, and would not have persisted on NIKE sites.

Periodic wipe testing of nuclear-armed missiles and the warheads were conducted for radiation leakage. Protocol required that rags utilized for these tests be disposed in lead-lined barrels and delivered for disposal as radioactive waste. This protocol was frequently not followed, however, and rags were often disposed as regular solid waste. No accounts of radiation leakage were identified, and since leakage of this type was taken very seriously and warheads strictly constructed, it is unlikely that rags were ever contaminated by any measurable amounts of radiation. Interviews confirmed this information.

7.1.4 General Launcher and Magazine Maintenance

Maintenance of the structural, mechanical, and hydraulic systems of the launcher and magazine were significant chemical-using operations. Similar to the maintenance functions required for the missile, the launcher and magazine required cleaning, painting, and hydraulic work. Launchers routinely leaked hydraulic fluid. The elevator used to move missiles up from underground magazines had an extensive hydraulic system.

NIKE sites varied somewhat in their magazine and launcher configuration. Underground magazines were standard, but were impractical in areas with high water tables (Florida) or permafrost (Alaska). Arrangement of the various facilities was dependent on the orientation of local terrain.

The magazine stored missiles and contained storage racks and a rail system used to deliver the missiles to the elevator. Once above ground, the missile was moved on rails to the launchers. Rail handling of missiles required that all portions of the rails, racks, and dolly wheels be clean and free of corrosion. The rail system was cleaned with metal brushes and solvent. Naphtha type solvents were routinely used to wipe down the rails, leaving a light, oily residue coating the surface. Painting of the rail structures probably utilized a lead oxide primer followed by a coat of "GI green", in accordance with Operating Manual procedures.

As with the launchers the missiles also routinely leaked hydraulic fluid and required routine maintenance. Leaking fluid was washed into surrounding soil. Used fluid that was drained from the launchers probably was collected for dumping or disposal by Army POL personnel. In some instances, disposal to a sump and subsequent subsurface leaching may have been practiced.

In the magazine, waste materials -- solvents, paints, and hydraulic fluid -- were often washed to the magazine sump located at the bottom of the elevator shaft. Leakage of fluid from elevator hydraulics could produce a considerable volume for disposal to the sump. Hydraulic system "blow-outs" occurring during operation of any hydraulic equipment would cause instant release of fluid.

Hydraulic fluid is a hydrocarbon oil of moderate viscosity. The constituents of hydraulic fluid, as with other petroleum products, are varied and numerous.

7.2 INTEGRATED FIRE CONTROL (IFC) AREA

7.2.1 Operations Maintenance

The primary mission of the IFC area was radar tracking and missile guidance. Radar, consisting of three systems, did not require extensive chemical use. Maintenance of radar was mostly electrical, utilizing small amounts of solvent for cleaning. The HIPAR System (High-Power Acquisition Radar) used a coolant pumping system consisting of an ethylene glycol circulating system and pump. The ethylene glycol was replaced annually. The pump was oil lubricated.

Paint composed the most significant chemical use on the radar systems. Disposal of paint at the IFC area was limited by the availability of disposal facilities. Waste paints were more likely to be collected and removed for off-site disposal or occasional "unofficial" dumping.

Fire control electronics also used certain electronic tubes that contain low-level radiation sources in minute amounts. These tubes were often disposed of indiscriminately in earlier portions of NIKE site operations. Tubes may have been disposed with solid waste or even "tossed" on the ground. In the latter portions of the NIKE program, these tubes were more strictly controlled. Despite possible on-site disposal, the volume and hazard of this material is minimal. A probable maximum of six of these tubes per year were discarded in this manner, according to the site interviews.

7.2.2 Vehicle Maintenance

Limited motor pool operations occurred on NIKE sites. An individual NIKE Battery did not have responsibility for vehicle maintenance. Vehicles were delivered to the battalion for all maintenance and service. Occasional minor service or emergency service may have consumed small volumes of solvents, paints, and lubricants, so that minor contamination in the area of the motor pool is possible. Some limited contamination from gasoline is also possible. It is noted that at some locations, the Battery motor pool was located in the Launcher Area.

7.3 GENERAL OPERATIONS

7.3.1 General Facilities Maintenance

Painting and cleaning were the only consistent chemical using operations for maintenance of other NIKE facilities. Buildings and structures were maintained and certain punitive functions for military personnel consumed paints and cleaning materials. The common building paints of the NIKE period used lead as a pigment (20-30 percent). On-site disposal of paint was variable. In some cases, ground leaching systems, such as the drainage at the assembly building, are likely to have been used. "Unofficial" dumping of paint was also likely. Septic systems may also have been used for disposal to a limited extent.

Water-soluble cleaning products are likely to have been discarded via surface disposal on-site, "flushing" to septic systems, or ground leaching systems. These products are unlikely to pose contamination problems, however, because of the limited quantities used.

Pesticides had some use at NIKE sites, however, their use was quite variable and probably did not pose a serious contamination hazard. Herbicides were used at some NIKE sites to maintain vegetation-free areas around site perimeters and launch areas. The function of this use was primarily fire control.

7.3.2 Utility Service

NIKE sites were supported by certain on-site utilities which pose significant potential for contamination. A number of generators were used to support emergency operation of the site, including radar on the IFC Area and missile readiness on the Launcher Area. Generators were carefully maintained and routinely tested. Diesel fuel was stored in large quantities for generator operation. Fuel was likely to have spilled during transfer and pumping operations. Tank were typically located below ground, and remained on-site after deactivation. Tanks probably leaked fuel while the site was operated, and fuel left in the tank after deactivation is likely to have leaked as the tanks deteriorated.

Tanks were also used to store fuel oil for heating purposes. Similar problems existed with these tanks, and quantities of fuel oil also are likely to have contaminated NIKE sites. These tanks could have been located either on the ground surface or below ground. Quantities of fuel oil and diesel fuel in use on NIKE sites consisted of an annual use of several thousand gallons. The extent of possible contamination from these tanks could vary considerably from site to site. The diesel and fuel oil storage tanks were sited at several locations on both the IFC Area and the Launcher Area.

Waste oils and hydraulic fluid were routinely used to control vegetation along underground cable-runs. Cable was usually run through shallow, concrete-walled troughs. Large cables connected the Launcher Area and the IFC Area . Oil was poured in or on the troughs to eliminate vegetation. This produced widespread, but low-level contamination in both the Launcher Area and the IFC Area.

Polychlorinated Biphenyls (PCBs) were also in use at NIKE sites in transformers. Release of PCBs would have been very infrequent since these are sealed units. Occasional rupture of transformers is possible and would have resulted in contamination with comparatively small volumes of material. When deactivation occurred, transformers remained on-site and eventual deterioration may also have resulted in some contamination. PCBs are relatively immobile in soil and contamination would have been limited to the area in the immediate vicinity of a leaking transformer. The quantities and infrequent release of PCBs make it unlikely that serious and consistent contamination will be found on NIKE sites.

Asbestos was in widespread use at NIKE sites for insulation purposes. It is unlikely that any quantity of asbestos was disposed on-site, since the material remained in place during operation and would require disposal as a solid waste. Although there is probably little asbestos present as a ground contaminant, it is likely to remain on-site in its original form in buildings, on piping and ductwork, until removed during demolition.

7.3.3 Deactivation

As previously stated in Section 2.0, paragraph (7), no site specific deactivation plans were obtained. The primary information concerning deactivation practices came from the site operator interviews. Two generic plans (references 8 and 9) were reviewed; however they did not address issues pertaining to chemicals or practices that may have involved contamination.

As stated, deactivation protocol according to stated procedures does not suggest any source of contamination, however, actual practice of deactivation probably resulted in disposal and/or abandonment of considerable volumes of potentially hazardous materials according to the site interviews. Specific practices varied significantly from site to site. Used chemical materials were normally returned to the depot at the time of deactivation for credit on the battalion budget. However, during deactivation, it often proved expeditious to simply abandon some materials, and partially-used or waste material was probably removed by the most efficient means. Dumping in municipal or "unofficial" dumps was reported to be widely practiced, as revealed in the interviews.

As an example of deactivation procedures at a particular site, an instance of dumping chromium trioxide (chrome VI) in excess of 100 pounds during deactivation was reported in the interviews. Waste oils, paints and solvents were discarded via sumps and other drainage. Barrel volumes of waste were delivered to landfills and dumps. On-site landfilling of waste probably occurred to some extent. Any dumping of UDMH canisters would have occurred at this time. Pesticide dumping in barrel quantities was also reported in the interviews. This could present a potentially serious, although very infrequent, contamination at the dump site. The serious possibility of contamination resulting from deactivation is difficult to address, however, because of the high variability of the disposal locations and the quantities of materials discarded. Any low-lying areas on-site which would be secluded from the primary operating area were likely candidates for some "unofficial" dumping both during site operation and at deactivation.

NIKE site operations and the resulting potential associated material contamination as discussed herein are summarized in two Tables as follows:

Table I (NIKE Site Operations and Associated Materials) presents the materials used under each NIKE site operations category together with the usual disposal method and results of such disposal.

Table II (General Materials Inventory of NIKE Sites) presents an alphabetical listing of the materials used, together with a quantity estimate of annual use, the purpose for which it was used, and the results of disposal. Table II was used to determine the Master Contaminant List for the purposes of NIKE Field Investigation Studies which is discussed in Section 8.0.

TABLE I

NIKE SITE OPERATIONS AND ASSOCIATED MATERIALS

OPERATIONS	MATERIALS	DISPOSAL METHOD	RESULTS OF DISPOSAL
1. Missile Assembly and Disassembly			
- Cleaning and Preparation	Solvents	Evaporation	None
		Drainage and Leaching	Persistent in Soils
	Anticorrosion Compound	Solid Waste Disposal	Minimal-Small Quantities
		Drainage and Leaching	Minimal-Small Quantities
- Lubrication, Sealing and Painting	Lubricants, Sealants, and Paints	Solid Waste Disposal	Dependant on Dumping Practices
		POL Turn-In	None
		Drainage and Leaching	Persistent in Soils
2. Missile Fueling and Warheading	UDMH	Depot Turn-In	None
		Burial (rare)	None-Rapid Reactive Decay
	IRFNA	Depot Turn-In	None
		Spills (rare)	None-Rapid Reactive Decay
	Aniline-Furfuryl Alcohol	Depot Turn-In	None
		Spills (rare)	Minimal-Small Quantities
	JP-4	Depot Turn-In	None
		Spills	Small-Persistent in Small Quantities
- Electrical Batteries	Sulfuric Acid (Electrolyte)	Draining and Leaching	None-Small Quantities, Reactive Deacay
	Lead	Draining and Leaching	Small-Limited Quantities

TABLE I

NIKE SITE OPERATIONS AND ASSOCIATED MATERIALS

OPERATIONS	MATERIALS	DISPOSAL METHOD	RESULTS OF DISPOSAL
3. Missile Maintenance and Testing			
- Cleaning and Corrosion Removal	Phosphoric Acid	Drainage and Leaching	None-Small Quantities, Reactive Decay
	Alodine Powder	Drainage and Leaching	Minimal-Small Quantities
	Chromium Trioxide Trioxide and Sodium Dichromate	Drainage and Leaching	Persistent in Soils
	Acids	Drainage and Leaching	Minimal-Reactive Decay
	Solvents (petroleum distillates and chlorinated hydrocarbons)	Drainage and Leaching POL Turn-In	Persistent in Soils None
- Painting	Zinc chromate and Lead	Drainage and Leaching POL Turn-In Solid Waste Disposal	Persistent in Soils None Dependent on Dumping Practices
- Hydraulic Work	Hydraulic Fluid	Drainage and Leaching POL Turn-In Solid Waste Disposal	Persistent in Soils None Dependent on Dumping Practices
- APS Testing	Ethylene Oxide	Burning Surface Dumping	None None-Rapid Reactive Decay

TABLE I

NIKE SITE OPERATIONS AND ASSOCIATED MATERIALS

OPERATIONS	MATERIALS	DISPOSAL METHOD	RESULTS OF DISPOSAL
4. General Launcher and Magazine Maintenance			
- Cleaning and Painting	Solvents, Paints, Lead	Drainage and Leaching POL Turn-In Solid Waste Disposal	Persistent in Soils None Dependent on Dumping Practics
- Hydraulic Work	Hydraulic Fluid	Drainage and Leaching POL Turn-In	Persistent in Soils None
5. Fire Control Operations Maintenance			
- Radar Operation	Ethylene Glycol	Unknown	Minimal-Small Quantities
- Electronics	Low-Level Radio-activity (Electronic Tubes)	Solid Waste Disposal Surface Dumping	Minimal-Small Quantities Minimal-Small Quantities
6. Vehical Maintenance	Solvents, Fuels, Lubricants, Paints	Drainage and Leaching Consumed POL Turn-In	Small-Limited Quantities None None
7. General Facility Maintenance			
- Painting and Cleaning	Paints, Lead	POL Turn-In Solid Waste Disposal Septic	None Dependent on Dumping Practices Persistent in Soils
- Vegetation Control	Herbicides	Consumed	Non Persistent

TABLE I

NIKE SITE OPERATIONS AND ASSOCIATED MATERIALS

OPERATIONS	MATERIALS	DISPOSAL METHOD	RESULTS OF DISPOSAL
8. Utility Service			
- Generator Operation	Diesel Fuel	Consumed Leakage	None Persistent in Soils
- Heating	Heating Oil	Consumed Leakage	None Persistent in Soils
- Vegetation Control in Cable Runs	Hydraulic Fluid and Oils	Surface Dumping	Small-Limited Quantities
- Electricity Service	Polychlorinated Biphenyls	Leakage	Small, Highly Variable
- Insulation (Fire Proofing)	Asbestos	None-Remains in structures	None (Minimal)
9. Deactivation	All Materials o Solvents o Lubricants o Fuels o Etc.	Dumping	Highly Variable-Persistent When Present

TABLE II

GENERAL MATERIALS INVENTORY OF NIKE SITES

MATERIAL	ANNUAL USE	USE CHARACTERISTICS	DISPOSAL METHOD
Acetone	20 gal.	Special Cleaning	Evaporation, Drainage and Leaching
Adhesives	50 lb.	Sealing Missile Components	Consumed, Solid Waste Disposal
Alodine Powder	10 lb.	Decorroding Metal Parts	Drainage and Leaching
Aniline	10 gal.	Ajax Fuel/Starter	Depot Turn-In, Spillage to Soil
Asbestos	500 lb.total	Insulation/Fire Proofing	Minor Release, Intact on Site
Benzene	100 gal.	Solvent	Evaporation, Drainage and Leaching
		General Solvent and Fuel Constituent	Fuel Tank Leakage
n-Butanol	20 gal.	Missile Cleaning	Drainage and Leaching
Carbon Tetrachloride	300 gal.	Solvent	Evaporation, Drainage and Leaching
Corrosion Preventatives (Pastes)	20 lb.	Metal Sealing of Missile	Consumed, Solid Waste Disposal
Chromium Trioxide	100 lb.	Decorroding Missile Parts	Drainage and Leaching, Surface Disposal

TABLE II

GENERAL MATERIALS INVENTORY OF NIKE SITES

MATERIAL	ANNUAL USE	USE CHARACTERISTICS	DISPOSAL METHOD
Diesel Fuel (Hydrocarbons)	10,000 gal.	Fuel for Generators	Consumed, Spillage to Soil, Fuel Tank Leakage
unsym.-Dimethyl Hydrazine	10 gal.	Missile Fuel/Starter	Depot Turn-In, Landfill
Dry Cleaning Solvent (Hydrocarbons)	500 gal.	Solvent	Evaporation, Drainage and Leaching
Electrical Insulating Oil	20 gal.	Electronics Lubricant	POL Turn-In, Leakage
Ethanol	20 gal.	Solvent	Drainage and Leaching
Ethylene Glycol	25 gal.	HIPAR Coolant	Unknown
Ethylene Oxide (Liquid Form)	200 gal.	APS Fuel	Burning, Surface Disposal
Freons (Chlorofuorocarbons)	Unknown	Solvent	Evaporation, Drainage and Leaching
Furfuryl Alcohol	10 gal.	Ajax Fuel/Starter	Depot Turn-In, Spillage to Soil
Gasoline (Hydrocarbons)	1,000 gal.	Vehicle Fuel	Consumed, Fuel Tank Leakage

TABLE II

GENERAL MATERIALS INVENTORY OF NIKE SITES

MATERIAL	ANNUAL USE	USE CHARACTERISTICS	DISPOSAL METHOD
Greases (Hydrocarbons)	100 lb.	Machinery Lubricant	Consumed, Drainage and Leaching, POL Turn-In
Heating Oil (Hydrocarbons)	20,000 gal.	Fuel	Consumed, Fuel Tank Leakage
Herbicides	20 lb.	Vegetation Control	Consumed
Hydraulic Fluid (Hydrocarbons)	2,000 gal.	Hydraulic Fluid	Drainage and Leaching, POL Turn-In, Surface Disposal
Isopropanol	20 gal.	Deicing of Equipment	Evaporation, Surface Disposal
JP-4 (Hydrocarbons)	500 gal.	Missile Fuel	Depot Turn-In, Drainage and Leaching
Lead (Carbonates and Oxide)	200 lb.	Paints and Battery Electrolyte	Drainage and leaching, POL Turn-In
Low-Level Radiation Sources	<1 lb.	Electrical Tubes	Solid Waste Disposal, Depot Turn-In
Lubricating Oils (Hydrocarbons)	200 gal.	Lubrication of Machinery	POL Turn-In, Drainage and Leaching Surface Disposal
Mineral Spirits (Hydrocarbons)	500 gal.	Solvent/Thinner	Drainage and Leaching

TABLE II

GENERAL MATERIALS INVENTORY OF NIKE SITES

MATERIAL	ANNUAL USE	USE CHARACTERISTICS	DISPOSAL METHOD
Molybdenum Disulfide	5 lb.	Lubricant	Consumed, Drainage and Leaching
Naphtha (Hydrocarbons)	50 gal.	Solvent/Thinner	Drainage and Leaching, Evaporation
Nitric Acid (IRFNA)	300 gal.	Missile Fuel/Starter	Depot Turn-In, Spillage to Soil
Paints (Hydrocarbons & Pigments)	300 gal.	Paint	Consumed, POL Turn-In, Drainage and Leaching, Surface Disposal, Solid Waste Disposal
Perchlorethylene (Tetrachloroethene)	100 gal.	Solvent	Evaporation, Drainage and Leaching
Phosphoric Acid	20 gal.	Cleaning Metal	Drainage and Leaching, Surface Disposal
Polychlorinated Biphenyls (PCBs)	100 gal.total	Electric Insulator	Removed, Intack on Site, Leakage to Soils
Propanol	10 gal.	Missile Cleaning	Drainage and Leaching
Selenium (Metallic)	100 lb. total	Rectifier Parts	Removal, Intact On Site, Solid Waste Disposal

TABLE II

GENERAL MATERIALS INVENTORY OF NIKE SITES

MATERIAL	ANNUAL USE	USE CHARACTERISTICS	DISPOSAL METHOD
Sodium Dichromate	50 lb.	Metal Cleaning	Drainage and Leaching
Sodium Phosphate (Tribasic)	50 lb.	Equipment Cleaning	Drainage and Leaching, Septic disposal
Stoddard Solvent (Hydrocarbons)	500 gal.	Solvent	Drainage and Leaching, Evaporation
Sulfuric Acid	30 gal.	Battery Acid	Drainage and Leaching
Toluene	50 gal.	Solvent	Drainage and Leaching
		Constituent of Fuels	Fuel Tank Leakage
1,1,1-Trichloroethane	500 gal.	Solvent	Evaporation, Drainage and Leaching
1,1,2-Trichloroethane	500 gal.	Solvent	Evaporation, Drainage and Leaching
Trichloroethene (Trichloroethylene)	500 gal.	Solvent	Evaporation, Drainage and Leaching
Tricresyl Phosphate	20 gal.	Special Lubricant	Drainage and Leaching
Zinc Chromate	100 lb.	Paint	Drainage and Leaching, POL Turn-In, Solid Waste Disposal

SECTION 8.0 - MASTER CONTAMINANTS LIST

8.1 GENERAL

Based on the previous analysis of site operations, this section presents the Master Contaminants List which consists of the potential contaminants of former NIKE sites. These contaminants should be investigated in the NIKE Preliminary Determination Phase (Phase II of this investigative program). As shown in Tables I and II, a number of many different substances were found to have potentially contaminated NIKE sites. Many of them, however, were not used in quantities that justify evaluation as a contaminant. Certain other substances that are potential contaminants were used erratically, and have an extremely small likelihood of being discovered on NIKE sites. Other possible contaminants have very brief life expectancies in the environment, and will no longer be present.

Also, further discussion is presented of criteria used for developing the Master List from the general inventory and discusses particular materials regarding their likelihood of being considered a potential site contaminant. The Master Contaminants List is presented as Table III at the conclusion of this Section.

8.2 MASTER LIST CONTAMINANTS

Each of the substances identified on the master list was used in significant quantities on NIKE sites and has a high probability of causing contamination. Most of the other materials identified in this investigation were eliminated from consideration since the volume of use on NIKE sites was small. Certain of the chemicals identified in previous investigations conducted by the United States Army Toxic and Hazardous Materials Agency were not included on the master list. The primary criteria for not including materials on the master list included:

- the materials were used only in small quantities,

- the materials were used with extreme care such that only minor quantities could have caused contamination and,

- the materials were reactive to the environment such that possible contamination from these materials would have dissipated rapidly with time.

Specific discussions of the substances comprising the master list, and of certain significant materials that were eliminated from the list, are presented in the following paragraphs. Materials on the Master List that represent additions relative to previous studies are so designated.

<u>Benzene</u> (New Listing)

Benzene was mentioned in Manual TM 9-1400-250-15/3. Benzene was probably in use as a solvent in the early stages of the NIKE program and was eliminated from updated standard equipment inventories. It remained in the text of the unrevised portions of the manual. Benzene was removed from military use due to its toxicity, much the same as was carbon tetrachloride. Benzene is also a common constituent of other solvents and fuels. Gasoline, for example, often contains significant amounts of benzene, so that NIKE site contamination from leaking fuel tanks or other solvent use increases the threat of benzene contamination.

<u>Carbon Tetrachloride</u>

As indicated in previous studies of NIKE sites (USATHMA DRXTH-AS-IA-83016), carbon tetrachloride was used in the early portions of the NIKE program. It is a superior solvent, and was used extensively for cleaning and degreasing.

Chromium (New Listing)

Chromium originates on NIKE sites in the cleaning materials chromium trioxide and sodium dichromate, as well as in zinc chromate and other paints.

Petroleum Hydrocarbons

Fuels, non-chlorinated solvents, naphthas, lubricants, paints, and hydraulic fluid all fall into the class of petroleum hydrocarbons. Because there are thousands of different but similar hydrocarbons, they are considered as a group when dealing with contamination from the materials mentioned above. In sheer quantity, hydrocarbons constitute the most significant potential contaminant of former NIKE sites.

Lead

Lead originates on NIKE sites in battery electrolyte and lead-based paints. Paint disposal at NIKE sites may have caused extensive contamination by lead.

Perchlorethylene (New Listing)

Interviews confirmed the use of perchloroethylene on NIKE sites. It was used as a solvent, probably after carbon tetrachloride use ceased, and before the introduction of trichloroethene and trichloroethanes. High volume use could be expected during that period.

Toluene

Toluene was specified as a cleaning solvent for missile components. It is also a major component of fuels and other solvents.

1,1,1-Trichloroethane, 1,1,2-Trichloroethane, and Trichloroethene

The use of these solvents was previously documented by USATHMA and was confirmed by this investigation.

8.3 OTHER MATERIALS CONSIDERED

The materials discussed in the following paragraphs are potential contaminants that were not placed on the master list of contaminants for the reasons previously discussed, but which warrant further discussion because they are mentioned in other source material as possible contaminants.

Unsymmetrical Dimethyl Hydrazine (UDMH)

UDMH was used in small amounts and stored for use in small sealed canisters. UDMH was carefully handled and controlled on NIKE sites. Spills very rarely occurred, and only intentional landfilling would present a contamination situation. In the environment, UDMH does not persist, because of its reactivity. UDMH will not occur on NIKE sites, except in sealed canisters, and will not be found in water or soil samples.

Ethylene Oxide

Ethylene oxide was used throughout the NIKE program as a fuel for the Accessory Power Supply (APS) system. This system burned ethylene oxide primarily to power missile guidance hydraulics. The system was tested periodically with a "hot run". Waste ethylene oxide was disposed of immediately by burning or dilution in water and on-site dumping. Ethylene oxide is a reactive, volatile liquid stored at low temperatures. (It has a boiling point of 11^{o} Centigrade). In the environment, it decays in a very short time. No ethylene oxide will remain as a NIKE site contaminant.

Aniline and Furfuryl Alcohol

These starter fuels were not used in large quantities and pose very little contamination hazard.

JP-4

JP-4 is a hydrocarbon fuel. Contamination by JP-4 is considered along with other fuels under the hydrocarbon category.

Low-Level Radiation

Radiation resulting from electrical tube disposal caused extremely minute contamination with no associated hazard. Leakage from nuclear weapons did not occur to the best of our knowledge.

IRFNA (Nitric Acid)

IRFNA was an extremely hazardous material that was treated with great respect by NIKE site operators. Very little contamination via spillage occurred. The small amounts that were spilled rapidly reacted to become nitrates. Nitrates occur naturally in soils and are very commonly used as fertilizer. There is practically no chance that serious contamination of NIKE sites occurred as a result of the use of IRFNA.

Polychlorinated Biphenyls (PCBs)

PCBs were present on NIKE sites in permanent, sealed electric transformers. Small, erratic leakage of transformers probably occurred during site operation and after deactivation. Contamination resulting from PCB's would be small, localized, unpredictable, and unlikely to be discovered except from visual observation of a leaking transformer. Therefore, PCBs were not included in the Master List for screening during the Preliminary Determination Phase. If PCB contamination is suspected, it will be investigated on a site specific basis.

Asbestos

Asbestos remains on-site in its original form in buildings, on piping and ductwork. It should be removed during demolition. Asbestos was not included on the Master List for screening during the Preliminary Determination Phase.

TABLE III
MASTER LIST OF SIGNIFICANT POTENTIAL NIKE SITE CONTAMINANTS

MATERIAL	USE CHARACTERISTICS	DISPOSAL METHOD
Benzene	Solvent	Evaporation, Drainage and Leaching
	General Solvent and Fuel Constituent	Fuel Tank Leakage
Carbon Tetrachloride (Tetrachloromethane)	Solvent	Evaporation, Drainage and Leaching
Chromium (Chromates, Chrome III, IV, and VI)	Decorroding Missile Parts	Drainage and Leaching, Surface Disposal
Petroleum Hydrocarbons	Fuels, Lubricants, Hydrocarbons	Consumed, Fuel Tank Leakage, Spillage to Soil, POL Turn-In, Drainagae and Leaching, Surface Disposal
Lead (Carbonates and Oxide)	Paints and Battery Electrolyte	Drainage and Leaching, POL Turn-In
Perchlorethylene (Tetrachloroethene)	Solvent	Evaporation, Drainage and Leaching
Toluene	Solvent Constituent of Fuels	Drainage and Leaching Fuel Tank Leakage
1,1,1-Trichloroethane	Solvent	Evaporation, Drainage and Leaching
1,1,2-Trichloroethane	Solvent	Evaporation, Drainage and Leaching
Trichloroethylene	Solvent	Evaporation, Drainage and Leaching

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3) USATHMA Fulton Property Survey. December, 1980. DAAK-79-C-0148

4) USATHMA Survey of the Former NIKE Site, Bristol, Rhode Island. December, 1980. DRXTH-IS-TR-81088

5) Personal Communication with five former NIKE site operators.

6) Personal Communication with military radiation safety personnel.

7) Personal Communication with municipal and industry representatives.

8) U.S.Army, NIKE Hercules Phaseout Plan. February, 1981.

9) U.S.Army, NIKE Hercules Inactivation Plan. February 1974.

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11) U.S.Army, TM 9-1410-250-12/1. Operator and Organizational Maintenance Manual: Intercept-Aerial Guided Missile MIM-14A and MIM-14B.

12) U.S.Army, TM 9-1440-252-34. DS and GS Maintenance of the Hercules Monorail Launcher, Launching-Handling Rail, Side Truss, Loading Rack Support, Launcher-Transport Modification Kit, Launcher-Subsurface Four-Rack Modification Kit, and Launcher Basis Accessory Kit. August, 1960.

DRXTH-AS-IA-83016

HISTORICAL OVERVIEW OF THE NIKE MISSILE SYSTEM

B.N. McMaster, J.B. Sosebee, W.G. Fraser, K.C. Govro, C.F. Jones, S.A. Grainger, and K.A. Civitarese

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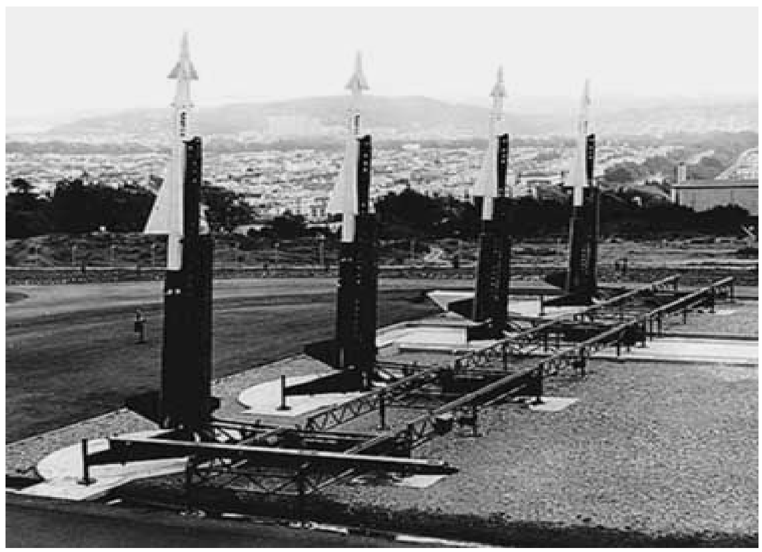
FINAL REPORT

NIKE MISSILE BATTERY

Environmental Conditions Assessment Guide



Defense Environmental Restoration Program
Formerly Used Defense Sites (DERP-FUDS)

July 2003

Prepared by:
U.S. Army Corps Of Engineers
HTRW-CX

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Final Report

Nike Missile Battery

Environmental Conditions Assessment Guide

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POC: Stan Bauer
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EXECUTIVE SUMMARY

The purpose of this report is to provide an overview of the Nike missile program and present detailed information on missile battery operations as described in applicable Army technical manuals and other documents. The operational information is relevant to consider along with site-specific information in developing a preliminary assessment (PA) and/or to evaluate the potential for environmental contamination. Full consideration must also be given to pre-Department of Defense (DoD) and post-DoD operations to determine whether there are other parties that may have contributed to the environmental contamination.

In 1954, the first Nike Ajax battery became operational. By 1958, there were nearly 200 Nike Ajax batteries. Deactivation and replacement of Ajax batteries with Nike Hercules batteries began the same year. Some Ajax batteries were converted while others were deactivated and declared excess. The phase out of Nike Ajax to Nike Hercules was completed in 1963.
The mission of the missile battery was to provide the missile launching and fire control components.

Nike-Ajax and Nike-Hercules missile batteries consisted of two principal operational areas: the battery control area, (or Integrated Fire Control (IFC)) and the launch area and adjacent assembly/service area. An administrative area provided housing and office functions was often collocated with one of the other areas or constructed on a third separate area. Utilities such as water, sewer, and electrical power were required as well as the storage of fuels.

The battery control area buildings, equipment and maintenance operations are discussed in Section 3. The battery control area operations, relative to potential contamination, include underground storage tanks, transformers and associated Diesel generators, sewage disposal, and maintenance activities such as painting and radar maintenance.

Storage tank locations in the battery control area include barracks, mess hall, HIPAR building and the generator building. Typically, installations had their own water treatment and sewage handling facilities. Site-specific sewage treatment facilities could include aeration/settling tanks, sewage lagoons, and/or septic tanks and leach fields.

The battery control area equipment comprised the ground guidance equipment necessary to acquire and designate targets, initiate commands to fire the missiles, control the flight of the missile, and automatically record certain events incident to those operations. Within the battery control area operational and visual inspections were conducted to assure that application of proper preventive maintenance. Periodic cleaning using mineral spirits, a petroleum distillate dry cleaning solvent and soap and water were specified. Other operations required used of organic solvent type paint remover, solutions of butyl alcohol, isopropyl alcohol, water and phosphoric acid, dilute chromic acid, trichloroethane, and toluene.

Radioactive tubes were present in certain radar sets and instructions were provided for shipping, storage, handling and disposal of broken tubes.

Launch area operations consisted of assembly, servicing, maintaining, and preparing the missiles for firing battery. Certain operations utilized solvents, corrosion preventives, and other chemicals in the assembly and service area as well as storage magazines and launcher area. The buildings and equipment associated with the operations are discussed in detail in the report. Fuel storage tanks, generators and transformers were identified in the generator building. Heating of the other buildings required use of fuel tanks. The locations of these tanks are shown in the building drawings.

There are important difference in the missiles that are notable in the assembly process, service and maintenance discussed in detail in the report. The specific cleaning, preserving, and related materials specified in technical manuals may change depending upon whether it was a Nike Ajax or Nike Hercules. These materials include:

- Mineral spirits
- Dry-cleaning solvents, P-D-680 and P-S-661
- Hydraulic fluids MIL-H-5606
- Trichloroethylene
- Trichloroethane
- Ethyl alcohol
- Emulsion cleaner (P-C-576A, type 1)

It is important to understand the difference in the two missiles and certain components. Of particular interest is the propulsion system, warhead and rocket motor igniter. The fueling of the Nike Ajax sustainer motor involved handling of the Inhibited Red Fuming Nitric Acid (IRFNA) oxidizer, propellant mixture (M3), and UDMH starting mixture while the solid propellant (a composite propellant containing ammonium perchlorate) sustainer of the Nike Hercules called for wiping of any perchlorate crystals from the small diameter rocket motor adapter threads and handling of ethylene oxide. Specific handling and disposal of these fuels is discussed. The double base propellant booster motors for both contained nitrocellulose and nitroglycerin. The boosters consisted of a single M5 rocket motor for the Nike Ajax and a cluster of four M5 rocket motors for the Nike Hercules.

Certain Nike Hercules missile numbers electron tubes containing radioactive materials. These radioactive materials were shipped, stored, handled and disposed of in accordance with technical manuals.

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Deactivation of the Nike system was carried out in an orderly manner requiring the preparation and shipment of:

- Power generation equipment
- Radar vans and launch control trailers
- Missile components
- Installed property
- Launchers, rails, and side tracks
- Small arms and riot control equipment
- Missile handling and test equipment
- Motor vehicles
- Aircraft

The deactivation schedule specifically called for retrieval and turn in of diesel fuel and motor gas. The process for deactivating and preparing this materiel for shipment is contained in the technical manuals.

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1. BACKGROUND

1.1 Purpose

The purpose of this report is to provide relevant information and general background of the Nike missile program with particular emphasis on the firing battery facilities and operations that required storage, handling, and disposal of solvents, fuels, hydraulic fluids, paints, and other materials to be considered in developing an environmental preliminary assessment and conducting a site investigation, as necessary. This reports mentions other maintenance echelons, however the primary focus is on the missile battery operations.

Documents cited are historical period documents when available supplemented by secondary source documents to fill in the information gaps. Due to local conditions and site-specific practices subject to local Nike battery control as well as the differences in Nike Ajax and Nike Hercules missiles, the US Army Corps of Engineers (Corps) districts are encouraged to develop collect site-specific information as necessary:

- Sewage treatment and disposal method
- Local disposal practices, sites and/or landfills used, if applicable

Appendix F, *Nike FUDS Sites,* and Appendix G, *How do I do research on NIKE Air Defense Missile Sites?* is provided to assist in finding additional information on a site-specific basis.

1.2 Nike Surface-to-Air Missile Program Background

The Nike Ajax and its replacement, the Nike Hercules, were two stage surface-to-air guided missiles. At most sites, the missiles were stored in underground magazines and raised to the surface for launching.

In April 1954, the US Army deployed the first operational Nike Ajax battery at Fort Meade, Maryland. By 1958, nearly 200 Nike Ajax batteries were deployed around strategic urban, military, and industrial complexes. In the same year, the Army began deactivating the Nike Ajax batteries and replacing them with the Nike Hercules. Due to the longer range and nuclear capabilities of the Hercules, only select Nike Ajax sites were converted. For example, only nine (9) of the 16 in the Los Angeles defense area batteries and 10 of 19 in the New York defense area batteries were converted to the Hercules. The phase out of Nike Ajax to Nike Hercules was completed in November1963. Ultimately, 145 Nike Hercules batteries were deployed: thirty-five (35) new batteries and 110 converted from the Ajax installations. Nike Hercules missiles remained deployed in the continental United States until 1974. By 1975, all Nike Hercules sites had been deactivated except in Alaska and Florida. Alaskan sites were deactivated in 1978 and Florida sites in1979. Appendix F identifies the sites by missile type and the radars deployed at each site along with the FUDS site number. (Lonnquest, 1996 at 57, 61, 63, 165, 172, 177, 182; Berhow at III.)

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The Nike Ajax system requirements and operational components remained relatively unchanged throughout the missile systems operational life. The Nike Hercules system was designed to utilize the Nike Ajax supporting components and followed similar operational procedures. The Nike Hercules system was contemplated prior to complete deployment of the Nike Ajax allowing certain Nike Ajax sites to be constructed with missile magazines and universal launchers capable of handling either missile.[1] The Nike Hercules was deployed as Basic Hercules or Improved Hercules. The increased range of the Nike Hercules did require improvements in the radar and guidance systems. High-powered acquisition radars (HIPARs) or alternate battery radars (ABARs) were installed on Improved Nike Hercules sites to track targets at greater range while an additional target ranging radar (TRR) was emplaced to counter enemy radar jamming attempts. Not all Nike Hercules sites were provided with this new equipment. There were no significant changes to the battery site configuration. Lonnquest, 1996 at 178-179.

Air defense against attacking aircraft was coordinated through command posts utilizing the "Missile Master" (AN/FSG-1) or "BIRDIE" command and control system. The Missile Master, a labor-intensive system, eventually became over-capable because the increased range of Nike Hercules reduced the number of batteries that needed to be coordinated. The "Missile Mentor" (AN/TSQ-51), a solid-state system, replaced the Missile Master in the mid-1960s." Lonnquest, 1996 at 178-179.

The Nike Hercules missile itself was advanced with the capability of being armed with single conventional or nuclear warheads. Both the Nike Ajax and Nike Hercules (see figures 4.8 and 4.9) were two stage missiles. The first stage booster dropped off in flight, while the second stage sustainer propelled the warhead to the target. A solid fueled missile sustainer replaced the liquid fueled sustainer used in the Nike Ajax. The use of solid fuel in the Nike Hercules significantly simplified the fueling and maintenance operations of the missile. The booster for the Hercules was a cluster of four Ajax boosters.

Initially, the Nike Ajax were operated by the active Army personnel, but during conversion to the Nike Hercules, Army National Guard units were trained and deployed at Nike Ajax sites as the active Army took over the Nike Hercules sites.

1.3 Air Defense Organization

1.3.1 North American Air Defense Command (NORAD)

NORAD, created in September 1957, was directly responsible to the United States Joint Chiefs of Staff and had jurisdiction over United States and Canadian Forces involved in aerospace defense. NORAD was comprised of a number of "component forces" including United States Army Air Defense Command (ARADCOM).[2] ARADCOM responsibilities for the Nike missile

[1]Although capable of handling either missile, the missiles were not mixed within a single magazine.
[2]The command established to carry out the specific Army defense mission was the United States Army Air Defense Command (ARADCOM). ARADCOM was officially formed on March 21, 1957, as a redesignation of the U.S. Army Antiaircraft Command (ARAACOM) that was formed in 1950. Westec, 1987 at 23.

system organized, trained, and equipped the Army air defense units. ARADCOM forces provided combat ready air defense units under operational control of NORAD, while ARADCOM retained command, administration, training, and logistical control. NORAD prepared the operation plans, conducted tactical exercises, and coordinated plans and requirements for new air defense weapons. The Continental Air Defense (CONAD) operated as a unified command under the Joint Chiefs of Staff, and performed all national air defense missions and was involved in broad national planning, separate from NORAD, while more detailed planning was accomplished by individual component commands including ARADCOM. Westec, 1987 at 23.

Under ARADCOM, Army air defense command posts (AADCP) were established for each defense battalion, group, or brigade. From the AADCP the Army air defense commander exercised operational control over all Army fire units within his defense area. For normal operations, the AADCP was under operational control of the NORAD Sector Direction Center; however, for command, the AADCP is directly subordinate to the ARADCOM region commander. Westec, 1987 at 23 & 26.

1.3.2 Air Defense Brigade

The air defense (AD) brigade consisted of a brigade headquarters and headquarters battery, and all the AD groups and battalions assigned or attached to it. The mission of the brigade was to provide tactical control and supervision to all AD units within its jurisdictional area. A brigade usually consisted of two or more Air Defense Groups. Westec, 1987 at 26-27.

1.3.3 Air Defense Battalion

The battalion, as the basic administrative unit of Nike air defense, consisted of a headquarters and headquarters battery, multiple (typically four) firing batteries, and emergency medical service at the battalion aid station. Transportation of re-supply missiles was an additional support requirement. Other transportation support provided for the minimal administrative purposes. The battalion commander was a Lieutenant Colonel.

1.4 Battery Mission and Organization

The basic operational unit was the Nike missile battery. The mission of the battery was "to provide the missile launching and fire control components" of the battalion. At full strength, the capabilities of the batteries were to provide:

- Delivery of a sustained and deliberate rate of fire from fixed positions against medium and high altitude hostile aerial targets;
- Assembly, testing and maintenance of missiles;
- Storage of basic load of missiles and warheads; and
- Qualified full time guards, dog handlers and sentry dogs for classified missile components security.[3]

For Improved Hercules sites, the capabilities were augmented by personnel and equipment for:

- Operation and maintenance of Improved Nike-Hercules Kit when authorized.
- Operation and maintenance of HIPAR/Improved Kit when authorized.
- Operation and maintenance of ABAR when authorized.

TOE 44-347, 44-448 and 44-547 at 1 & 3.

See Figure 1-1 for the typical missile battery and its relationship to the battery headquarters and battalion.

The Table of Organization and Equipment (TOE) established the minimum essential quantities and types of equipment to accomplish the mission. Additional equipment, when required, had to be requested for authorization and approval through procedures established by Army Regulation. Allowance could be decreased or omitted by the commanders of major commands. TOE 44-347, 44-448 and 44-547 at 6.

The typical missile battery consisted of a headquarters section, a fire control platoon, a launching platoon headquarters, an assembly and service section, three launching sections, and (security section for Nike Hercules sites).[4] Authorized augmentation sections are shown on the TOE organizational chart. Their duties as described in the January 1956 Field Manual 44-80 "Procedures and Drills for the Nike I System" are:

- Headquarters Section - The organization and responsibility of the headquarters section is essentially the same as in AAA gun batteries.

[3] The Fire Fighting Unit and the Fire Unit Integration Facility were eliminated due the absence of volatile liquid fuels and the advanced electronic capability. Because the Hercules was capable of being armed with a nuclear warhead, a Security Section was added to Hercules sites in the form of an inner fence and sentry dogs. Cole at 254-255.

[4] Contrary to a number of previous reports, there is no motor pool section designated in the TOEs for the missile Batteries. Motor pool maintenance support was designated as a Battalion function.

- Fire Control Platoon - The fire control platoon is responsible for the operation and maintenance of the fire control equipment in the battery control area.
- Launching Platoon Headquarters - The launching platoon headquarters is responsible for the operation and training of the three launching sections. It contains technically trained personnel to assemble, test, and perform organizational maintenance on the Nike I missile and booster and launching section equipment. It is responsible for assembling and testing missiles and boosters, and for the maintenance of the rounds at the launching section.
- Launching Section - The three launching sections are responsible for the preparation of the missile and booster for firing after they have been delivered to the launching section from the assembly and test area and for routine non-technical tests, checks, adjustments, and organizational maintenance. TOE 44-347 at 7, 44-448 at 7 and 44-547 at 8; Westec, 1987 at 27 & 31.

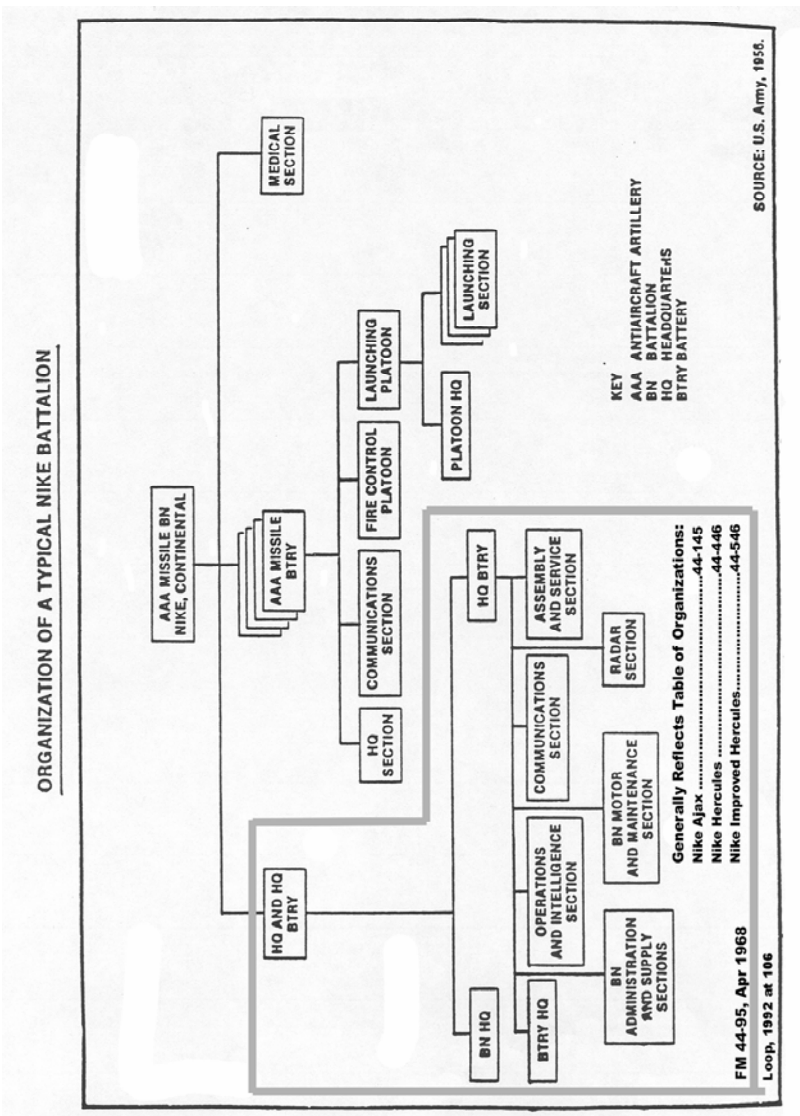

Figure 1-1: Typical Nike Battalion

1.5 Depots, Field, and Battalion Maintenance

Depot maintenance of ground guidance, handling, launching equipment and the guided missiles were provided by Pueblo Ordnance Depot, Erie Ordnance Depot, Letterkenny Ordnance Depot, and Mount Rainier Ordnance Depot. Benicia Arsenal performed reconditioning, repair and maintenance of missiles. These depots and arsenals stored and issued, less explosive components and fuels. Depot maintenance of explosive components and renovation of explosive components were provided by Anniston Ordnance Depot, Letterkenny Ordnance Depot, Pueblo Ordnance Depot, Savanna Ordnance Depot, Seneca Ordnance Depot and Sierra Ordnance Depot. Ordnance Support Plan General Plan at 6-7 and Annex I at5-6; Cowell at 83-86, 92-94, and 106-107. Field maintenance shops and battalion support performed maintenance on missiles and support equipment that was beyond the capability or equipment of the battery. The field shops were typically located on nearby military installations while battalions were located with the air defense headquarters.

1.6 Annual Service Practice

Training included annual service practice (ASP) firing competition conducted at McGregor Range at Fort Bliss Texas. “ In addition to ASP, firing units were tested on-site through scheduled and no-notice BLAZING SKIES alerts” which could be called as often as once a week. Any aircraft in the area could be designated as a target, and the firing drill completed short of the actual launch. Cole at 254. Practice firing also took place at certain operational sites in Hawaii and Alaska.

1.7 System Operation

Excerpts taken from “To Defend and Deter: The Legacy of the United States Cold War Missile Program” by John C. Lonnquest, 1996 and David F. Winkler provide a description of the Nike Ajax system operations.

“The Nike Ajax command guidance system received guidance information from a computer on the ground.” During an imminent attach, a missile launch was preceded by a warning sent to the battery by the Air Defense Command Post. Sirens would alert personnel to take their assigned battle stations. The launch area personnel conducted last-minute pre-firing checks and positioned the missiles on the launchers.

As the missiles were readied, the potential target was picked up by the Nike acquisition radar known as LOPAR for "Low-Power Acquisition Radar." The battery commander used "electronic interrogation" to determine if the target was friend or foe. If the designated target was hostile, the information was transferred to the target-tracking radar (TTR). The TTR determined the target's azimuth, elevation, and range, and provided that information to the computer guiding the Nike Ajax missile. Once energized, the guidance computer received a running account of the target's changing position.

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The missile-tracking radar (MTR) locked onto the missile selected to perform the intercept. When the target entered the battery's range, the battery commander would launch the missile. After the initial thrust, the missile booster dropped away and the missile was tracked by the MTR receiving continuous data on the missile's flight. Using the continuous data from the TTR and MTR, the computer generated course correction information and transmitted it to guide the missile toward the target. At the predicted intercept point, the computer transmitted a burst signal that detonated the three high-explosive warheads. Figures 1-2 and 1-3 illustrate the operations for the Nike Ajax and the later Nike Hercules system.

The Ajax guidance system could engage only one target at a time and once deployed there was no capability for coordinating fire between multiple batteries. This system thus could allow several batteries could engage the same target and allow other targets to pass through. "To alleviate this problem, ARADCOM established command centers where incoming targets were manually plotted and engagement orders were passed to the batteries." The inadequacies of this voice command and control system were addressed in the late 1950s with the introduction of the Interim Battery Data Link (IBDL). IBDL provided a "real-time" target data link between the batteries so that battery commanders could readily see what targets other batteries were actively engaging.

While IBDL was being deployed, the Army tested a successor system called "Missile Master" at Fort Meade, Maryland. After this system was proven within the Baltimore- Washington Defense Area, other major defense areas began receiving the Missile Master (AN/FSG-1) systems. Missile Master was the first truly integrating command and control system featuring automatic data communications, processing, and display equipment. By eliminating voice communications, this Martin-built system allowed an area commander to use all his batteries to engage up to 24 different targets.

Smaller defense areas with fewer batteries received another command and control system called the Battery Integration and Radar Display Equipment "BIRDIE" (AN/GSG-5)." Lonnquest, 1996 at 168-169

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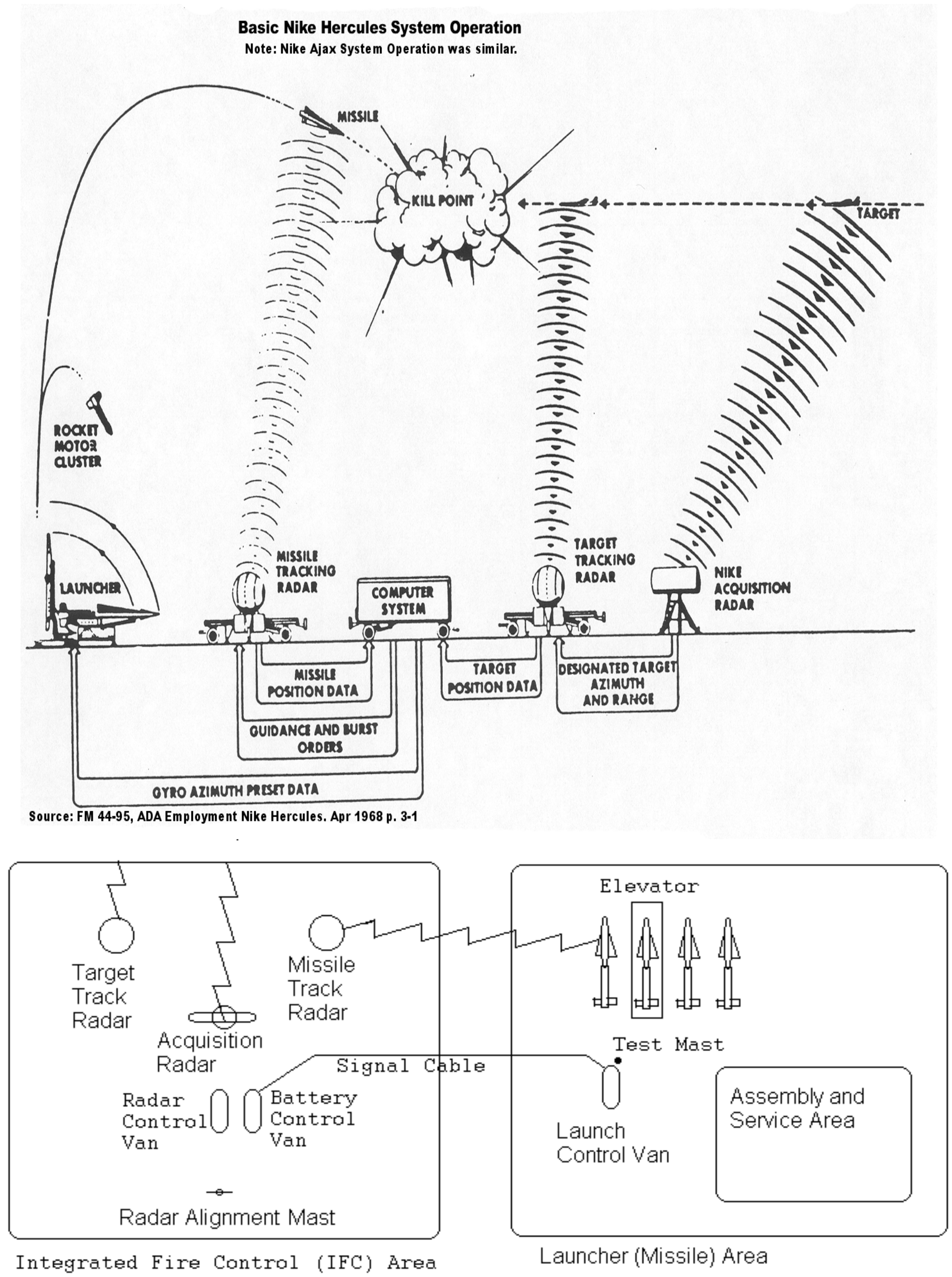
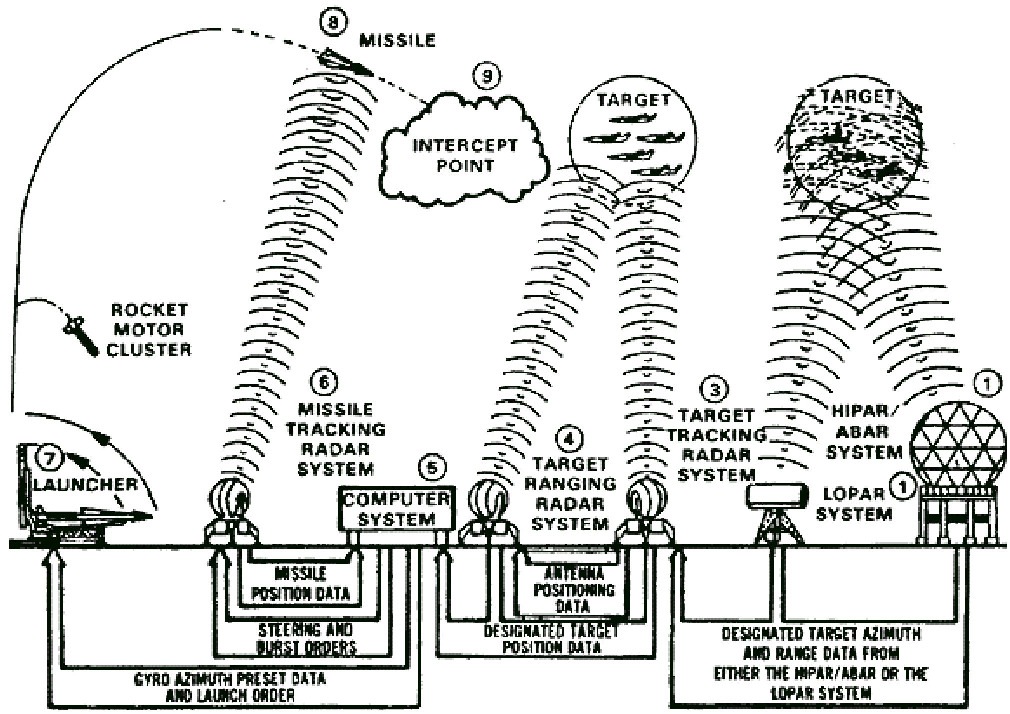
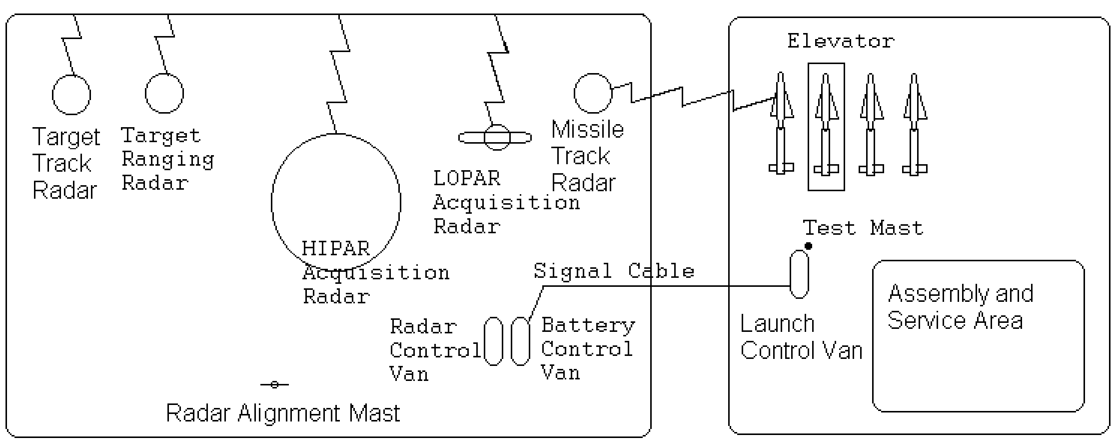


Figure 1-2: Basic Nike Hercules System Operation
(Note: Nike Ajax was similar)

BATTERY CONTROL AREA



Improved Nike-Hercules missile control and guidance system



Integrated Fire Control (IFC) Area

Launcher (Missile) Area

Figure 1-3: Improved Nike Hercules System Operations

2. NIKE BATTERY SITE

2.1 Battery Designation

The Nike-Ajax fixed sites were staggered between out-skirts and close-in locations to provide for greater defense capability. The battery control area for each site was located in an inner ring towards the vital area with the launcher areas located farther out away from the vital area. Battery site designations were based on a 100-segment circle. See Figure 2-1 for an example of battery site designation.

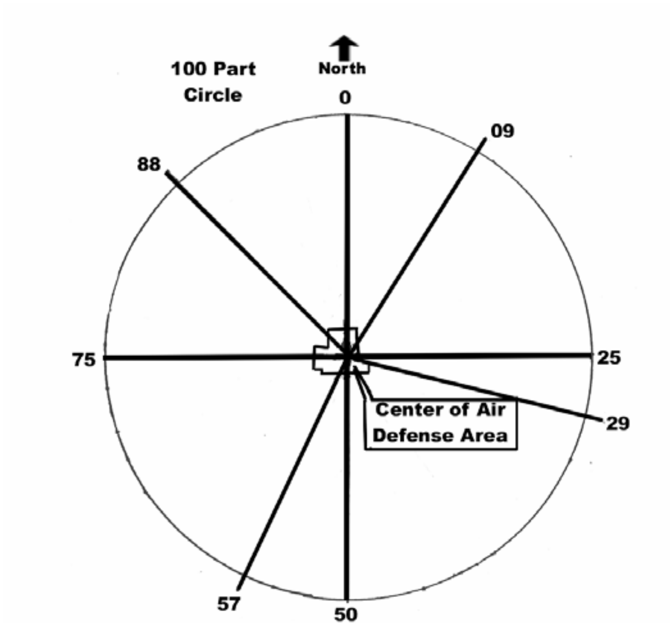


Figure 2-1: Nike Site Designation System

As the Nike Hercules replaced existing Nike Ajax facilities, the greater range of the Nike Hercules allowed for wider area coverage and several Nike Ajax batteries were permanently deactivated. The Nike Hercules sites were located further away from target areas due to the nuclear warheads carried by the missile. Nike Hercules batteries constructed in the late 1950s and early 1960s were placed in locations that optimized the missiles' range and minimized the warhead damage. "Local Corps of Engineer Districts supervised the conversion of Nike Ajax batteries and the construction of new Nike Hercules batteries." New sites that were located away from populated areas were not confined in acreage and consequently could utilize above ground missile storage and maintenance facilities located behind earthen revetments. Some of these above ground Hercules sites protected Strategic Air Command (SAC) bomber bases. Lonnquest, 1996 at 181-182.

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2.2 Battery Layout

Nike-Ajax and Nike-Hercules missile batteries were very similar. Each battery consisted of two principal operational areas: the battery control area, (also called Integrated Fire Control (IFC)) and the launch area with launchers and adjacent assembly/service area. Figure 2-2 shows a typical permanent Nike-Hercules battery. The Nike Ajax batteries also included missile fueling facilities not required by the Nike Hercules. An administrative area provided housing and office functions. These facilities could be collocated with one of the two principle areas or as a separate area. Utilities such as water, sewer, and electrical power were required as well as the storage of fuels. In general, the battery control area was located on relatively level and well-drained terrain and higher than the launch area. This area had to be free of any visual obstructions to allow a direct line of sight between the radar equipment, missiles and targets. The physical layout of the facilities on a site was adapted to site-specific topography, land availability and other site-specific conditions while using standardized "modified emergency" design structures. There were slight variations in these standard designs. An overview of the Nike battery facilities and operations are provided in the Section 3 and 4. While launch sites generally stored missiles in the underground magazines, most of the sites protecting SAC bases stored missiles on the surface with earthen berms around the launchers. Also, some of the early Ajax launch sites were temporarily above ground until underground magazines were constructed.

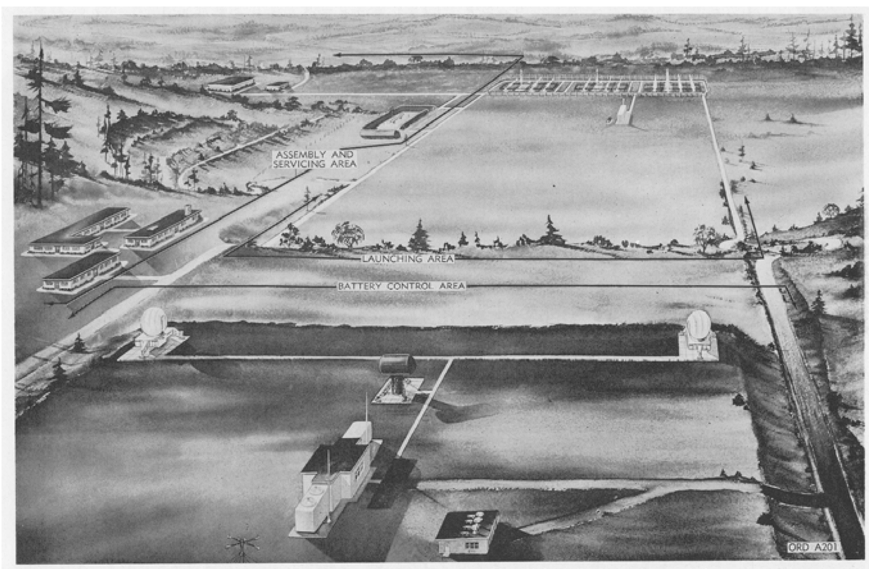

Figure 2-2: Typical Permanent Missile Battery

Site-specific details may be obtained from historical records such as “as-built” drawings, on-site inspections, and interviews with personnel stationed at the site need to be evaluated for individual FUDS sites. Alaska had unique requirements discussed in the Military Engineer, March-April, 1960. Appendix G provides information useful in conducting site-specific research.

3. BATTERY CONTROL FACILITIES AND OPERATIONS

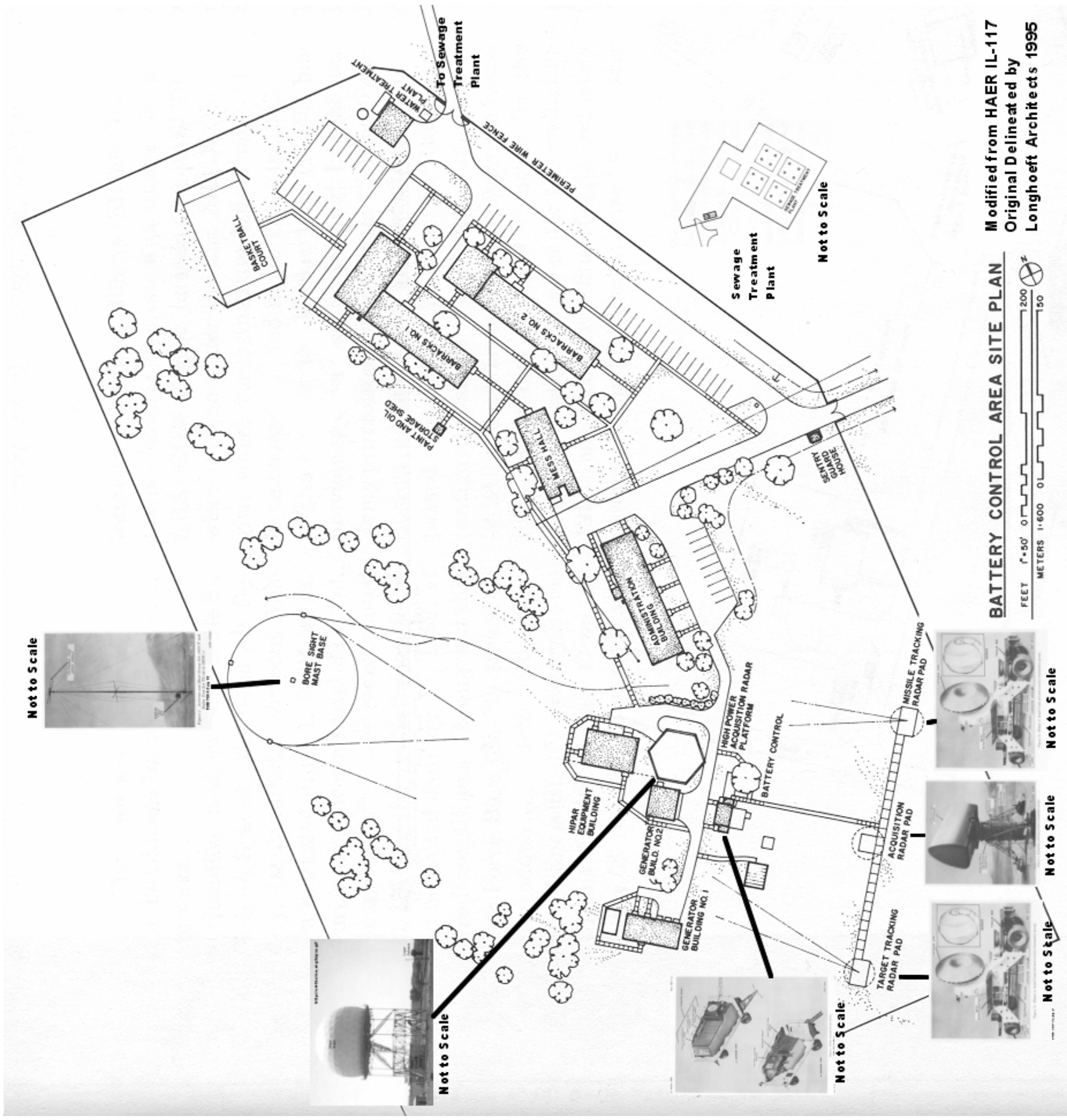

Figure 3-1: Typical Nike Hercules Missile Battery Control Area

This section will present a discussion of the battery control area buildings, equipment and maintenance operations. The administration and barracks areas were often located at the battery control area. They could, however, also be located at the launcher area (LA) or on a separate parcel of land. For the purpose of this report the buildings will be discussed at the beginning of this section under Administrative and General Support Facilities followed by Battery Control Equipment. The battery control area operations, relative to potential contamination, include underground storage tanks, transformers, sewage disposal, and maintenance activities such as painting and radar maintenance. See Figure 3-1 for an example of a typical Hercules battery control area (also known as Integrated Fire Control area).

3.1 Administrative and General Support Facilities and Operations

3.1.1 General Facilities Maintenance

All buildings and structures would be subject to painting and general cleaning as well as heating requirements. No specific information was found on these operations.

3.1.2 Electrical power and Generator Buildings

The power for the radar course-directing central used 400-hertz (Hz) power. This power was obtained from three sources, 60-Hz commercial power, 60-Hz generators or 400-Hz generators. Power from the 60-Hz sources was converted to 400-Hz by motor generators. A generator building at the battery control area housed the 60-Hz or 400-Hz diesel-driven generators. Commercial power was used for maintenance and non-tactical training while generated power was used for engagement, tactical training, and whenever commercial power was not available. Electrical power brought to and metered at or near the battery area entrance or other convenient location. FM 44-82 at 13; MS-70 “as built” drawing.

Standard drawing ME 26-03-34 for the generator building in the control area show a floor trench to the generators and frequency converters. No detail drawing was available for this trench. Details of the trench for the generator building in the launch area may provide information relevant to this trench. The trenches were sloped to drain. See Figure 3-2. Drawings ME 26-03-34. It should be noted that some buildings may also have been renovated when Nike Ajax sites were upgraded for Nike Hercules.

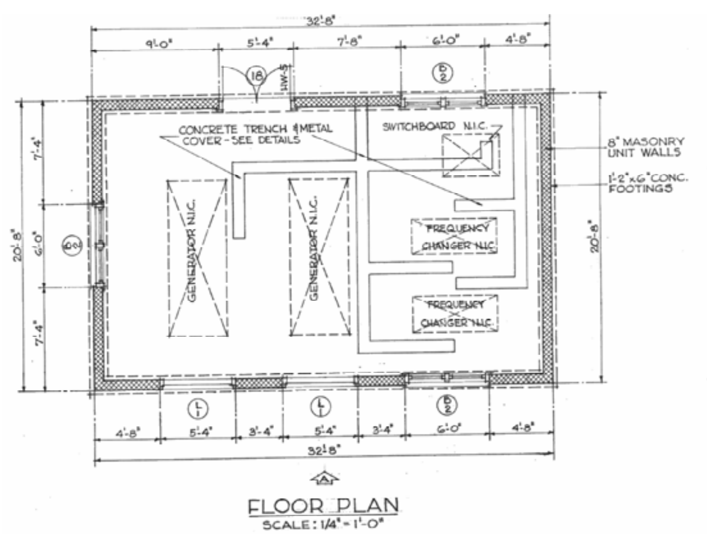

Figure 3-2: Battery Control Generator Building

3.1.3 Diesel and Fuel Oil storage Tanks

Storage tanks for diesel fuel and fuel oil for heating could be above or belowground. These tanks were located at several locations throughout the battery control and launch areas. Fuel usage and heating units varied some depending upon the temperature zone. Deactivation procedures called for diesel fuel and motor gas to be retrieved and turned in. Site-specific review of the tanks and their usage must be evaluated, buried propane tanks have been found on some locations in place of oil storage tanks at some buildings. Storage tank locations in the battery control area include barracks, mess hall, HIPAR building, and generator building.

3.1.4 Water Treatment and Sewage Facilities

Typically, Nike installations had their own water treatment and sewage handling facilities. However, urban and suburban sites may be connected to municipal systems. Depending on location, these facilities could include wells and pump houses for water service while sewage treatment facilities could include aeration/settling tanks, sewage lagoons, and/or septic tanks and leach fields. Certain operational buildings were provided with floor drainage such as the generator building discussed above. Site-specific evaluation of the drainage and sewage handling systems should be considered. Whitacre, 1996 at 56.

3.1.5 Motor Pool

Nike missile battery motor pool maintenance operations were typically provided at the battalion level as illustrated by Figure 1-1 in Section 1. However, if site-specific information indicates the presence of motor pool operations, some minor use of solvents, fuels, and lubricants may have occurred.

3.1.6 Weapons

Military police (MPs) carried rifles and/or pistols requiring storage of small quantities of ammunition. The specific storage area is not designated on the drawings. There are no identified firing ranges on Nike sites.

3.2 Battery Control Equipment

The battery control area, also known as the integrated fire control (IFC) area, equipment was composed of the Radar Course-Directing Central which contained the ground guidance equipment necessary to acquire and designate targets, initiate commands to fire the missiles, control the flight of the missile, and automatically record certain events incident to those operations. The battery control area was the information and communications point for the battery. Communication cables connected the various elements within the control area. An inter-area cable connected with the launch area. Whitacre, 1996 at 56-57; PAM 750-1-2 at 8; FM44-82 at 8; Westec, 1987 at 47.

During conversion of Ajax to Hercules, selected sites received the Improved Hercules package of new high power acquisition radars (HIPAR). However, HIPAR radars were not installed at some sites due to geographical constraints and/or to avoid duplication of radars located at adjacent sites. ABAR radars were also used instead of HIPAR at certain locations. Lonnquest, 1996 at 182.

Originally designed as a mobile system for use by a field army, the Nike system was deployed for continental air defense on permanent installations. In order, to maintain it's suitability for mobile use, key pieces of the Nike system's radar, launch, and battery control equipment were deployed as mobile trailers connected through communications cables. An Army training manual noted, "It appeared more reasonable to adapt the mobile equipment for use in a fixed type of installation rather than to redesign the equipment specifically for fixed installations. The latter would be costly and time-consuming and it offered no promise of operation improvement or substantial ultimate economy." Whitacre, 1996 at 57-58; Westec, 1987 at 49.

Table 3-1 provides the nomenclature list for the major battery control equipment for both the Nike Ajax and Hercules systems.

Table 3-1
Nomenclature for Major Battery Control Equipment (TM 9-500)

Battery Control Area Equipment Description	Nike-Ajax	Nike-Hercules
Low-Power Acquisition Radar (LOPAR), aka as Acquisition Radar	Antenna-Receiver-Transmitter Group, Acquisition: OA-653/MS	Antenna-Receiver-Transmitter Group, Acquisition: OA-1596/T and OA-1601/T, w/e
Battery Control Trailer	Director Station, Guided Missile, Trailer Mounted: AN/MSA-7, AN/MSA-7A, AN/MSA-17, AN/MSA-17A	Director Station, Guided Missile, Trailer Mounted: AN/MSA-19
Radar Control Trailer	Tracking Station, Guided Missile, Trailer Mounted: AN/MPA-4 and AN/MPA-4A	Tracking Station, Guided Missile, Trailer Mounted: AN/MPA-5
Missile-Tracking Radar	Antenna-Receiver-Transmitter Group, Missile Tracking, Trailer Mounted: OA-654/MPA-4 through 654G/MPA-4	Antenna-Receiver-Transmitter Group, Missile Tracking, Trailer Mounted: OA-1340/MPA
Target-Tracking Radar	Antenna-Receiver-Transmitter Group, Target Tracking, Trailer Mounted: OA-655/MPA-4 through 655G/MPA-4	Antenna-Receiver-Transmitter Group, Target Tracking, Trailer Mounted: OA-1487/MSA
Radar Collimation Mast Assembly	Antenna Mast Group: OA-739/MSW-1	Antenna Mast Group, Collimation: OA-1600/T

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Table 3-1
Nomenclature for Major Battery Control Equipment (TM 9-500)

Battery Control Area Equipment Description	Nike-Ajax	Nike-Hercules
High-Power Acquisition Radar (HIPAR)	Not Applicable	Mobile version AN/MPQ-43
Alternate Battery Acquisition Radar (ABAR)	Not Applicable	Radar Set AN/FPS-69, AN/FPS-71 or AN/FPS-75

A brief discussion of the function of the basic equipment is presented below.

Acquisition Radar/LOPAR[5]. The Acquisition Antenna-Receiver-Transmitter Group, also known as LOPAR, contained a receiver-transmitter that generated and radiated into space, a radio frequency energy necessary to detect and acquire a target. In addition, this receiver-transmitter received target echoes and converted them into a usable intermediate frequency. A listing of major components of which this group is comprised is presented below. See Figure 3-3. PAM 750-1-2 at 9.

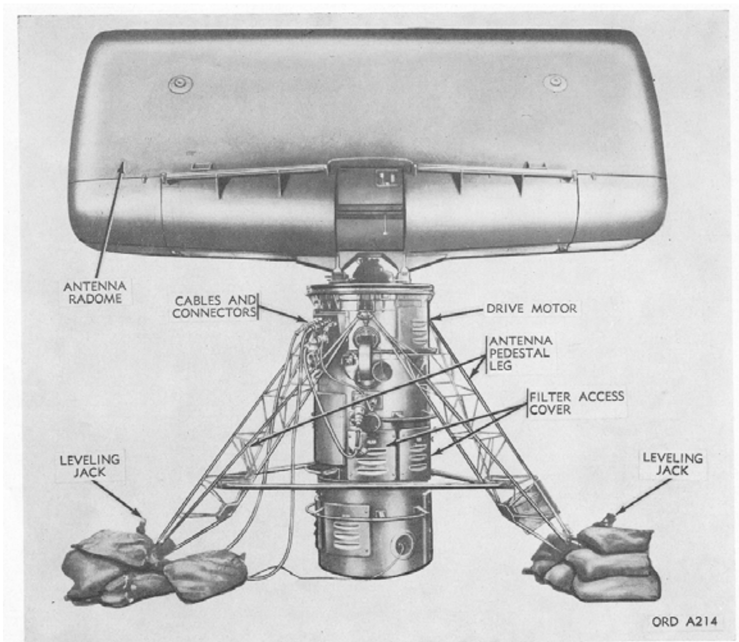

Figure 3-3: Acquisition Radar

[5] "The **LOPAR radar** was very much like the original Nike Ajax (and M-33 gun) acquisition radar but with reduced pulses per second to match the longer range HIPAR radar or the ABAR radars mentioned above. It provided another "eye to the sky" and another problem for enemy jammers." http://ed-thelen.org/ifc_acq.html#LOPAR

Trailer Mounted Director Station. This station consists of a four-wheel, van-type trailer containing electronic equipment necessary for the operation of the computer system, the acquisition radar system, tactical control system, recording equipment, and communication equipment. The major components of this station are:

- The director station group containing the primary power equipment necessary for the trailer's lighting, heating, and ventilating and operation of the acquisition radar system equipment.
- The battery control console containing the controls, presentation indicators, automatic plotting boards, and circuitry associated with the acquisition radar system, computer system, and tactical control system. The console monitors and controls the operation of these systems to direct target engagement.
- The computer group contained subgroups and the assembly associated with the computer system. The computer power supply group contains the power equipment necessary for operation of the computer system. The servo computer assembly contains the equipment associated with the computer ballistic information. The computer-amplifier-relay group contains the majority of the electronic computing equipment necessary for operation of the computer system.
- The early warning plotting board provided early warning position information by recording plots of targets out of range of the battery radar.
- The recorder group contained recording and voice communication equipment. The recording equipment provides a record, on film, of equipment performance during a tactical or test engagement. The communication equipment consisted mainly of a switchboard that provided two-way communication between all system telephone locations.
  PAM 750-1-2 at 10.

Trailer Mounted Tracking Station. This station was a four-wheel, van-type trailer that housed the computing equipment necessary for the operation of the target tracking and the missile tracking radar systems. The major components of the station were:

- The target radar control console containing the controls, presentation, indicators, and equipment necessary for the operation of the target tracking radar system.
- The missile radar control console containing the necessary controls, a presentation indicator, and other equipment required for operation of the missile tracking radar system. Proper positioning of switches on this console caused the missile tracking radar to function automatically for acquiring and tracking the missiles.
- The radar power supply group contained the power equipment with associated regulators and timers necessary for the target tracking and missile tracking radar systems.
- The radar set group contained the video detection circuits, the angle and range tracking error circuitry, and data potentiometers necessary to provide the ranging and receiving information necessary for the missile and target tracking radar systems.
- The radar coder set contains the automatic equipment necessary to convert information from the computer system into steering and burst orders that are then transmitted to the missile in flight. PAM 750-1-2 at 12.

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Trailer Mounted Missile-Track Antenna-Receiver-Transmitter Group (MTR). This group outwardly identical in appearance with the target-track antenna-receiver-transmitter group described below, contained the transmitting and receiving equipment necessary to transmit coded pulses which directed the missile in its flight and it receives pulses transmitted by the missile. PAM 750-1-2 at 14.

Trailer Mounted Target-Track Antenna-Receiver-Transmitter Group (TTR). This group contained the transmitting and receiving equipment necessary to supply continuous target position information to the computer. Once locked on target, it automatically tracked the target as long as it was within range. PAM 750-1-2 at 14.

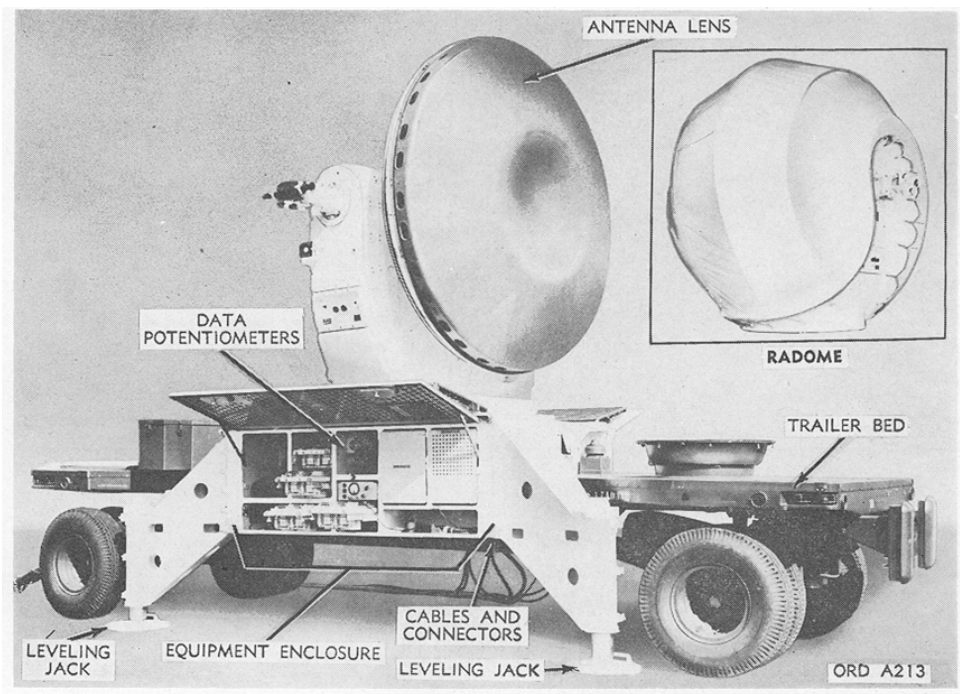

Figure 3-4: Tracking Radar

Antenna and Mast Group OA-1600/T. This group along with the Radar Test Set TS-847A/MSW-1, see next paragraph, was used during aligning and testing of the target and missile tracking radar systems. The alignment assured that the electrical, optical, and mechanical axes of the radar systems were in coincidence. This is done by adjustment of the optical and electrical axes to the mechanical axis. The mast was usually about 60 feet tall and was located approximately 600 feet from the missile-tracking radar and the target-tracking radar and provided a common reference point for adjusting the radars at adjacent sites. Spatially, the mast assembly and the two tracking radars formed a tall triangle. Lonnquest, 1996 at 172-173; Whitacre, 1996 at 59; PAM 750-1-2 at 14.

<u>Radar Test Set TS-847A/MSW-1</u>. The Radar Test Set together with the Antenna and Mast Group OA-1600/T (f1 above) was used during alignment and testing of the target and missile tracking radar systems. For test purposes, the test set is mounted on a frame near the bottom of the antenna and mast group and it serves as a target substitute during the testing and alignment procedures. PAM 750-1-2 at 14.

<u>High-Power Acquisition Radar (HIPAR)</u>. HIPAR increased the detection range, altitude coverage and improved the system's capability to detect small, high-speed targets at long range. The HIPAR was often located on a support and tripod structure, often as high as 50 feet. A radome covered the radar and various antennas. There were usually three types of antennas: the main, omni, and auxiliary antennas. The HIPAR building housed the transmitter and receiver systems and non-tactical operational controls. During conversion selected sites received the Improved Hercules package of new radars. However, HIPAR radars were not installed at some sites due to geographical constraints and/or to avoid duplication of radars located at adjacent sites. ABAR radar was used in place of HIPAR on certain locations. See Figure 3-5. Lonnquest, 1996 at 182; Whitacre, 1996 at 58-59; FM 44-82 at 10-11.

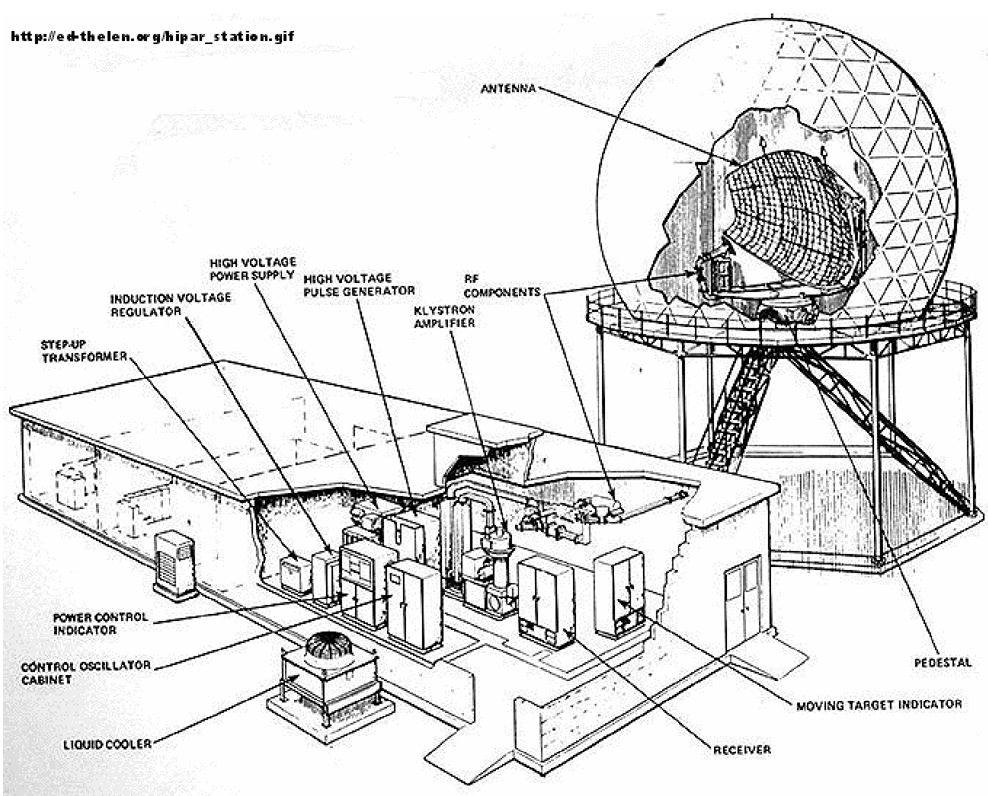

Figure 3-5: HIPAR and Support Building

Fire Unit Integration Facility (FUIF). The FUIF equipment received and decoded data sent by the fire distribution system (FDS) to the fire unit and coded and transmitted data sent by the fire unit to the FDS equipment at an AADCP. The FUIF equipment is housed in a room adjacent to the electronic shop or in the HIPAR building. FM 44-82 at 14.

Alternate Battery Acquisition Radar (ABAR). In lieu of the HIPAR, Some Improved Hercules systems we equipped with ABAR (radar set AN/FPS-69, AN/FPS-71, or AN/FPS-75) to improve target detection range and electronic counter-counter measures. The ABAR equipment less the antenna assembly was sheltered in a building. The antenna assembly was mounted on a concrete tower. See Figure 3-6. FM 44-82 at 11.

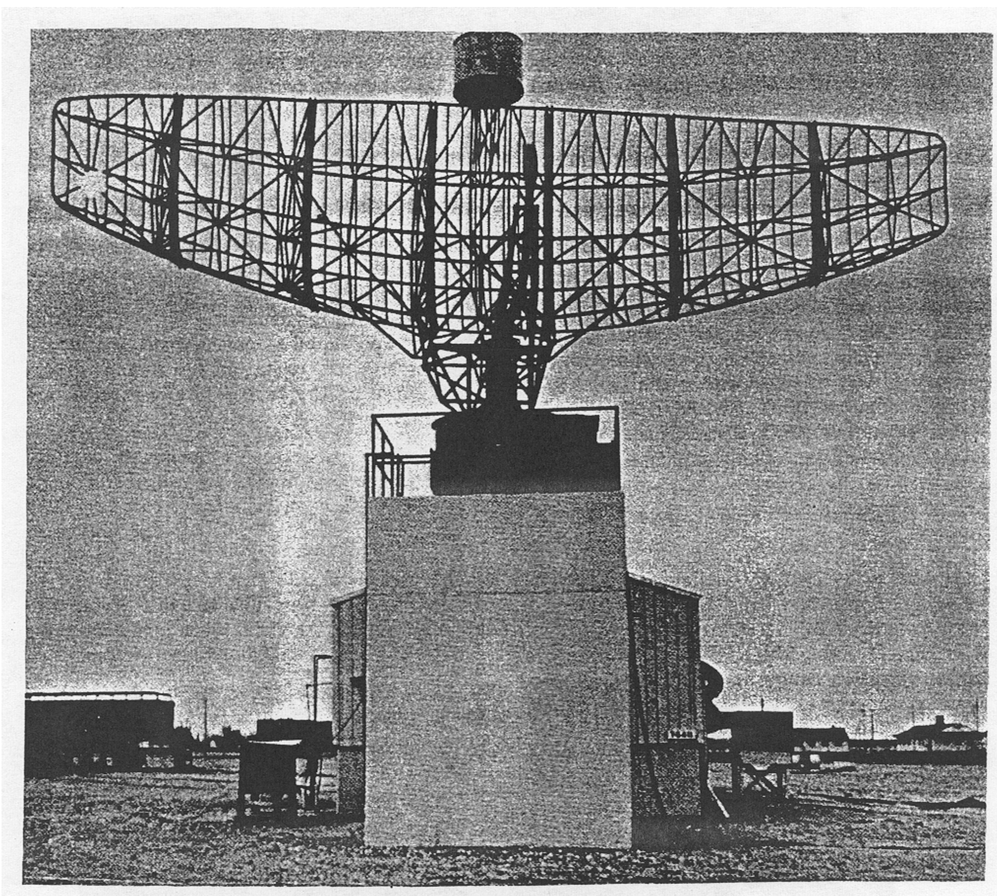

Figure 3-6: ABAR

3.3 Operations

For the purpose of this report, the operations within the battery control area include the inspection and maintenance of radars and guidance equipment. Operational and visual inspections were conducted to assure that application of proper preventive maintenance was being continually performed. The immediate operational status of the Nike antiaircraft guided missile system was dependent upon continuous application of preventive maintenance. Preventive maintenance indicators (PM Indicators) described below were selected key inspection points that indicated the status of the Nike missile system. The indicators contained were applicable to the inspection of both electronic and mechanical components of the Nike system. These indicators were not sufficient to determine the complete operational status of the system, therefore, detailed inspection by qualified technical personnel were also required[6]. PAM 750-1-2 at 3.

The indicators were divided into two categories, i.e., visual PM Indicators and operational PM Indicators. Visual PM Indicators were checks on the overall physical appearance and outward condition of the equipment found in the battery control area. Operational PM Indicators were checks of an electronic and/or mechanical nature to determine the functional status of individual components or the entire system. The inspection of the Radar Course-Directing Central contained within the Battery Control was performed by two methods, i.e., visual and operational PM Indicators. PAM 750-1-2 at 6-7.

Operational PM Indicators listed included both the battery control and launch area:

- Checks of equipment in operational status with power available.
- Checks for indications of overheating, erratic actions, incorrect response, unusual noises, and pressure surges.
- Checks for correct air and hydraulic pressures; air, oil, and propellant leaks; and correct action of interlocks.

PAM 750-1-2 at 6-7.

Visual PM Indicators included:

- Checks for cleanliness, corrosion, deterioration, unauthorized attachments, freedom from cuts, scratches, warps, pits, burs, dents, ruptures, and holes.
- Check for proper fit and tight closure, missing or damaged gaskets, freedom of movement, lubrication, and absence of moisture, and foreign material.

PAM 750-1-2 at 6-7.

[6] No technical manuals have been found for detailed organizational maintenance of this equipment.

During annual service practice (ASP), the battery radar units were disassembled at the battery location for major maintenance and service checking.
*From LRL Nike History

Technical Bulletin 9-337, Guided Missile Systems Corrosion Control and Treatment, date March 1961 was for organizational and field maintenance personnel based on the facilities and capabilities of these echelons. The bulletin provides general information regarding corrosion control as related to preventive and corrective maintenance operations and was applicable to all components of the missile system. Included illustration of missile handling equipment, test sets, launch equipment, missile components, and LOPAR and tracking radars identifies periodic inspection for corrosion control. Periodic cleaning to remove corrosive agents was conducted using mineral spirits and dry cleaning solvent to clean grease or oil from painted surfaces. Direct contact between these petroleum products and rubber was to be avoided. When unavoidable, the contacted rubber part was washed with soap and water. **Gasoline, benzene, or carbon tetrachloride was not to be used**. TB 9-337 at 4-5.

Preparation to remove corrosion from painted surfaces required paint stripping with organic solvent type paint remover, MIL-R-25134. Methods of corrosion removal included mechanical and chemical. Chemicals used a solution of **butyl alcohol, isopropyl alcohol**, water and **phosphoric acid**. Magnesium parts were not to be cleaned with chemicals but through mechanical means or use of dilute **chromic acid**. Corrosion on brass and copper parts were also mechanically removed and loose particles removed by a cloth moistened with **trichlorethane**. TB 9-337 at 5.

During follow-up painting operations, primer was to be applied before the finish coat. **Toluene** was used to wipe off over-spray of primer. Treatment for specific metals were given as follows:

A) Treatment for Aluminum with Similar Metals.

1. Apply corrosion resistant primer (item 20).[7]
2. Apply resin-acid metal-pretreatment coating compound (item 17).
3. Apply one coat of primer. Use vinyl-zinc chromate primer coating (item 45) when top coat is enamel. Use zinc yellow primer (item 46) when top coat is lacquer.
4. Apply two coats of the appropriate lacquer or enamel (table III).

[7] Item reference number refers to TM 9-337 list of materials in Appendix D.

B) Treatment for Aluminum with Dissimilar Metals.

1. Apply corrosion resistant primer (item 20).
2. Apply resin-acid metal-pretreatment coating compound (item 17).
3. Apply two coats of primer. When top coat is enamel, use vinyl-zinc chromate primer coating, (item 45). When top coat is lacquer, use zinc yellow primer (item 46).
4. Apply two coats of the appropriate lacquer or enamel (table III).

C) Treatment for Magnesium.

1. Apply chrome-pickle solution (par. 14).
2. Apply resin-acid metal-pretreatment com- pound (item 17).
3. Apply two coats of primer (four coats on castings). When top coat is enamel, use vinyl-zinc chromate primer coating (item 45). When top coat is lacquer, use zinc-yellow primer (item 46).
4. Apply two coats of the appropriate lacquer or enamel (table III).

D) Treatment for Cadmium.

1. Apply resin-acid metal-pretreatment compound (item 17).
2. Apply two coats of primer. When top coat is enamel, use vinyl-zinc chromate primer (item 45). When top coat is lacquer, use primer coating (item 44).
3. Apply two coats of the appropriate lacquer or enamel (table III).

E) Treatment for Aluminum-clad Steel.

1. Spray on aluminum lacquer (item 33).

F) Treatment for Non-corrosion-resistant Steel.

1. Apply resin-acid metal-pretreatment com- pound. (item 17).
2. Apply three coats of primer. When top coat is enamel, use vinyl-zinc chromate primer item 45). When top coat is lacquer, use primer coating (item 44).
3. Apply two coats of the appropriate lacquer or enamel (table III).

G) Treatment for Corrosion-resistant Steel.

1. Apply Pasajel (item 42).
2. Apply resin-acid metal-pretreatment com- pound (item 17).
3. Apply one coat of primer. When top coat is enamel, use vinyl-zinc chromate primer (item 45). When top coat is lacquer, use primer coating (item 44).
4. Apply two coats of the appropriate lacquer or enamel (table III).

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H) Treatment for Miscellaneous Metals.

1. Use procedure as given in treatment F above. TB 9-337 at 8.

Specific mention was made for maintaining acquisition and tracking radars.

- Air filters were cleaned and recharged regularly. This included cleaning in a bath of several inches of **trichlorethane (1,1,1-TCA).** These filters were recharged with OE10 or OE30 oil.
- Equipment slides coated with light coats of grease or corrosion preventive compound were frequently inspected for dirt and sand and cleaned as needed with 1,1,1-TCA.
- Corrosion products on cables and plugs were removed with 1,1,1-TCA applied by small brush and crocus cloth.
- Dirt and corrosion in transformer terminals, high voltage cables and surrounding areas of the radars high voltage power supply were 1,1,1-TCA. TB 9-337 at 11.

The list of paints and related materials and their uses are included in Appendix D. TB 9-337 at 9-10.

TM 9-1430-254-12/3 includes a radiation hazard warning for radioactive tubes contained in the HIPAR radar set (AN/MPQ-43). These radioactive materials were shipped, stored, handled and disposed of in accordance with TM 38-250, AR 755-380, and AR 55-55. The TM discusses the cleaning of surfaces if the tubes were broken. The surfaces were to be cleaned by a wet method described as one pass wiping. A wet cloth was used for a single pass wipe, folded and a clean side used for the next single pass. Back and forth motion was not to be used as it may rub the radioactive material into the surface. The broken tube and all cleaning materials were to be sealed in a container for disposal. TM 9-1430-254-12/3.
[Reserved for additional information upon receipt of radar TM(s)].

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4. LAUNCH AREA OPERATIONS

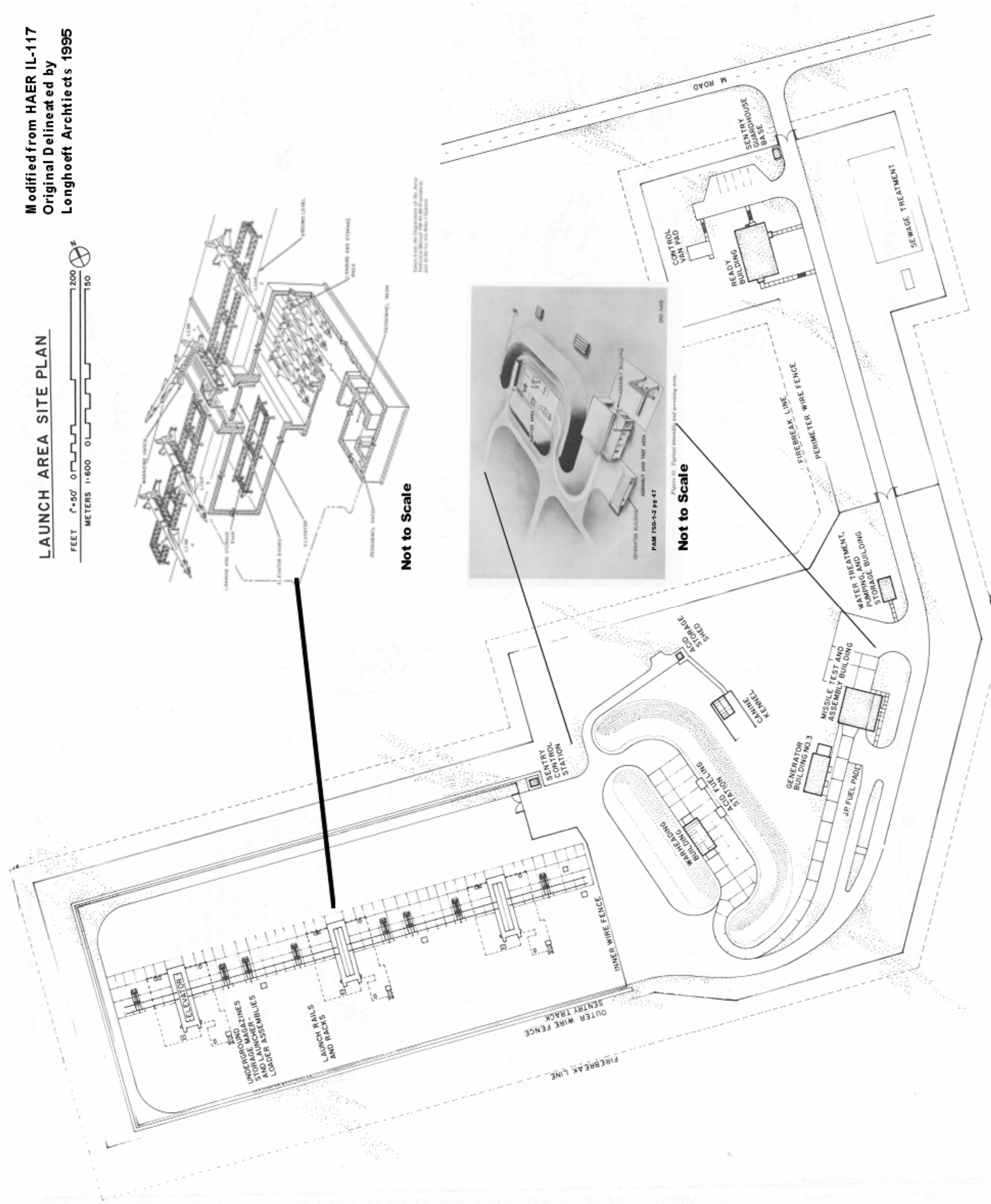

Figure 4-1: Typical Nike Hercules Missile Launch Area

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The missiles and warheads were assembled, serviced, maintained, and prepared for firing at the launch area (LA) of a Nike missile battery. All operations necessary to ready the missiles were conducted at specific locations within the launch area. Certain operations utilized solvents, corrosion preventives, and other chemicals that should be considered in environmental investigations. These operations included preventive and organizational maintenance. Missile servicing and handling equipment used at these sites also received organizational maintenance at the launch area. Figure 4-1 is a representative example of a launch area.

This section describes the areas of a typical permanent site, primarily the assembly and service area and launch area. Each area has associated buildings and equipment. Buildings and equipment features or requirements that may be of interest for environmental purposes are discussed in detail.

4.1 General Buildings

The launch area included a ready building, sentry guardhouse, canine kennels, and an oil storage shed. The ready building for the crewmen included a squad room, a dining and day room, toilet, and heater room. A fuel oil storage tank was typically located outside the heater room.

4.2 Assembly and Service Area

The assembly and service area is divided into two basic sections, the assembly area and the service area, located near the launching area. Its location was limited by the terrain considerations. The separation between buildings was governed by ordnance quantity distance tables.

4.2.1 Assembly Area

The assembly area is used for receiving, assembling, and testing the missiles. The assembly area contains a receiving and storage area, an assembly building, and a generator building. Specific information on the initial assembly and test operations performed in the assembly area for the missiles is described later.

4.2.2 Assembly and Test Building

Initial missile assembly and test operations were conducted in the assembly and test building. Adjacent hardstand received, uncrated, and stored missile components. Missiles arrived in major assembly components unassembled and unarmed. The assembly consisted of the installation of the missile fins, ailerons or elevons, and missile body sections and system tests. Two large overhead doors at either end allowed the missiles to be rolled in and out of the main test and assembly room. Other rooms included a stock room, first aid room, restroom, and boiler room. A concrete walkway was provided for moving the missile from this building to the service area. ME 35-60-04 and 35-60-29. See Figures 4-2a and 4-2c for configuration assembly and test buildings.

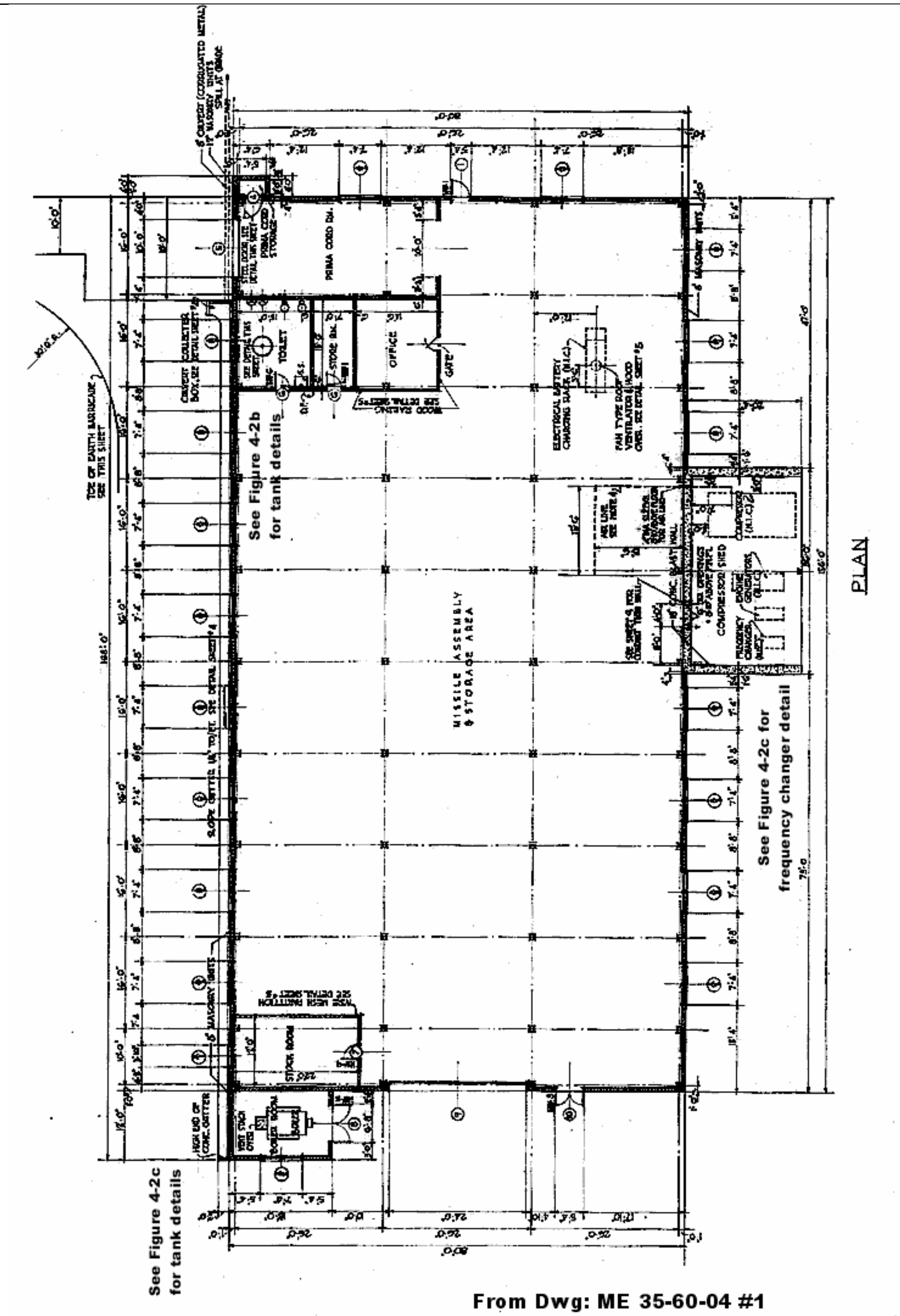

Figure 4-2a: Nike Ajax Assembly and Test Building

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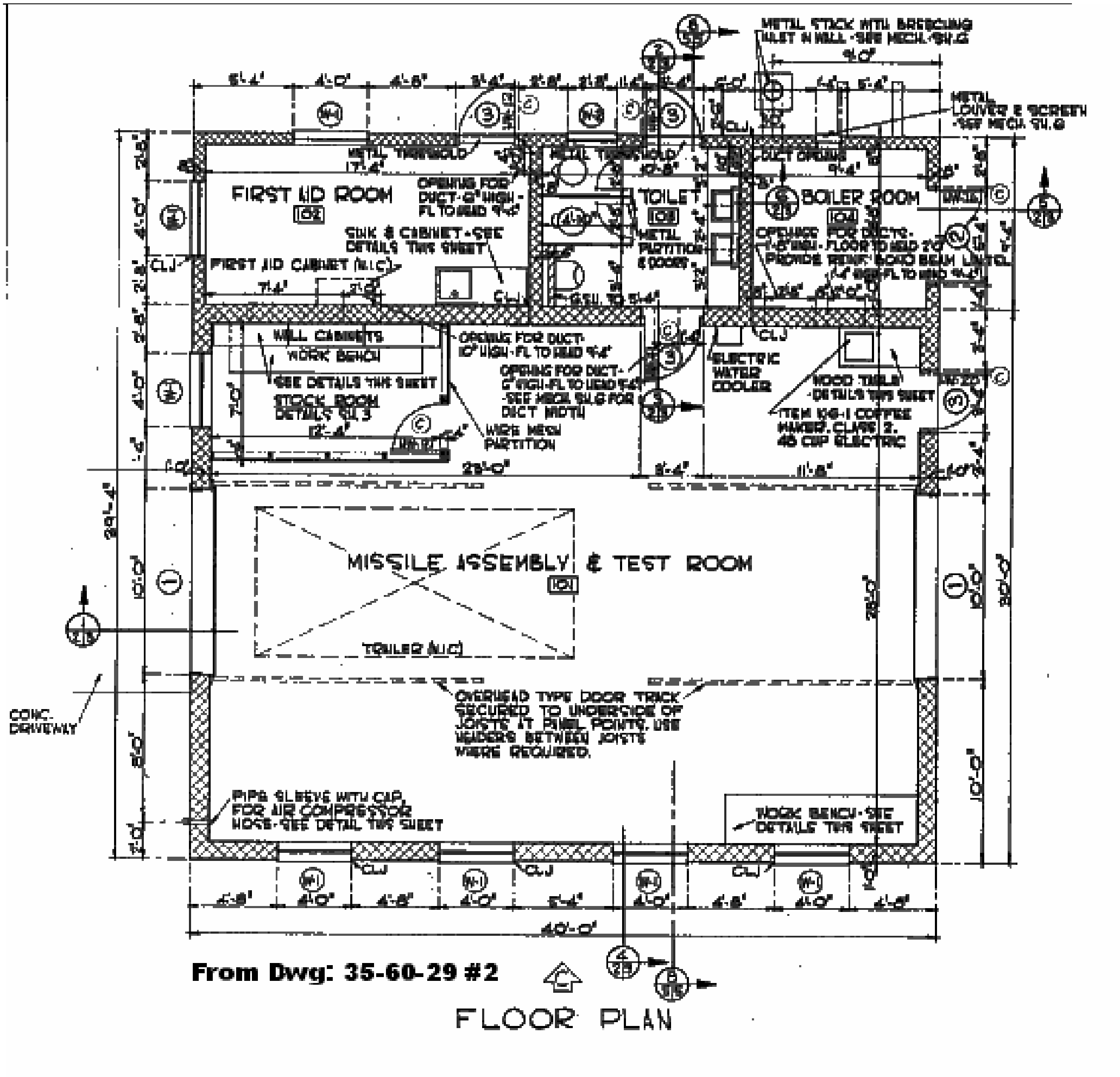

Figure 4-2b: Nike Hercules Assembly and Test Building
(Electrical and Heating Plan)

(Please see Figure 4-2c for fuel tank details)

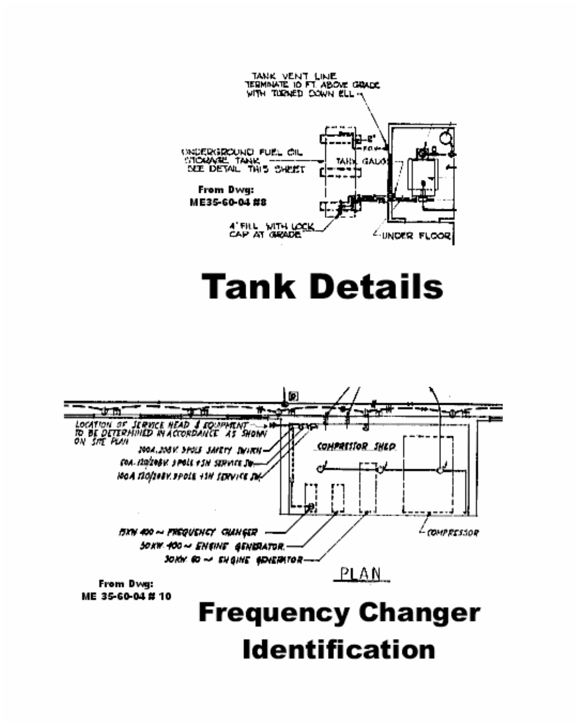

Figure 4-2c: Nike Ajax Assembly and Test Building Details

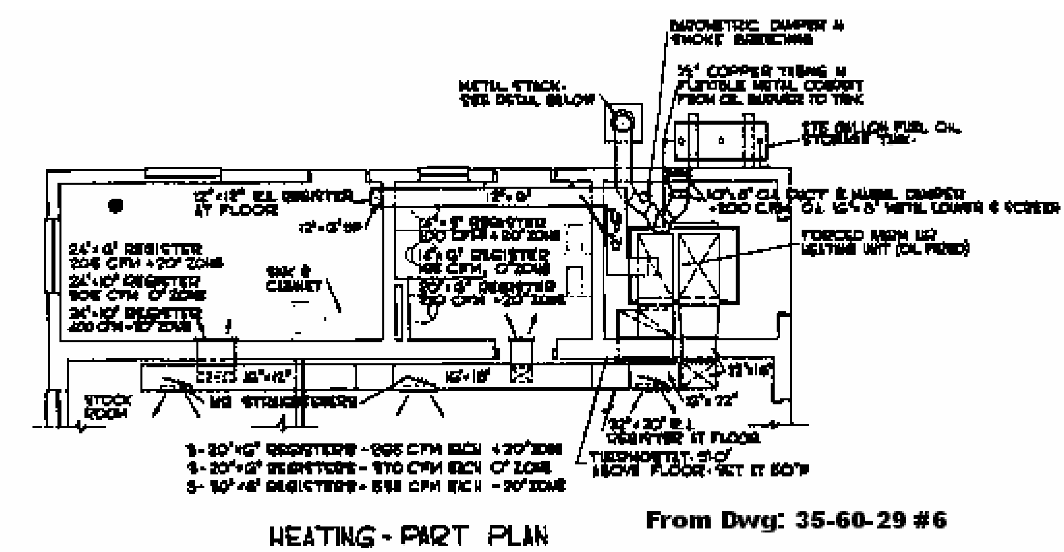

Figure 4-2d: Nike Hercules Assembly and Test Building Fuel Tank Detail

4.2.3 Generator Building

The generator building housed the generators that provided stand-by electrical power for the assembly and service area in the event that the commercial electrical power should fail. The power for the launching platoon equipment was supplied by a commercial source or by 150-kw, 60-Hz generators. Motor generators (converters) were used to change 60-hertz (Hz) power to 400-Hz required by the launching equipment. The generator building at the launch area housed the 60-Hz or 400-Hz diesel-driven generators. Commercial power was used for maintenance and non-tactical training; power from electric generator sets was used for engagement, tactical training, and whenever commercial power was not available. Electrical power required for operation of the launching area is standard Army frequency converters at permanent (subsurface) installations. PAM 750-1-2 at 28; FM 44-82 at 21; TM 9-1450-250-12 at 6; AR 750-530 at 5.

The generator building provided electrical power to the assembly and test building, service area, and storage magazines. A 1,000-gallon underground fuel storage tank feeds into a 275-gallon day tank located inside the generator building. Fuel was supplied to the generators via ¾ inch supply lines with a flexible connection to the engine fuel pump. The fuel oil lines, fuel return lines and electrical conduits were located in a common floor trench. The trench was sloped to provide drainage. Transformers were mounted outside the generator building for utilization of commercial power. See Figure 4-2e: Typical Generator Building Launch Area. ME 26-03-40 Sheets 1-4.

TM 9-5016-2 recommends inspection and preventive maintenance of transformers for secure installation, cracks, charring, discoloration, and leakage of oil or potting compound. TM 9-5016-2 at 142.

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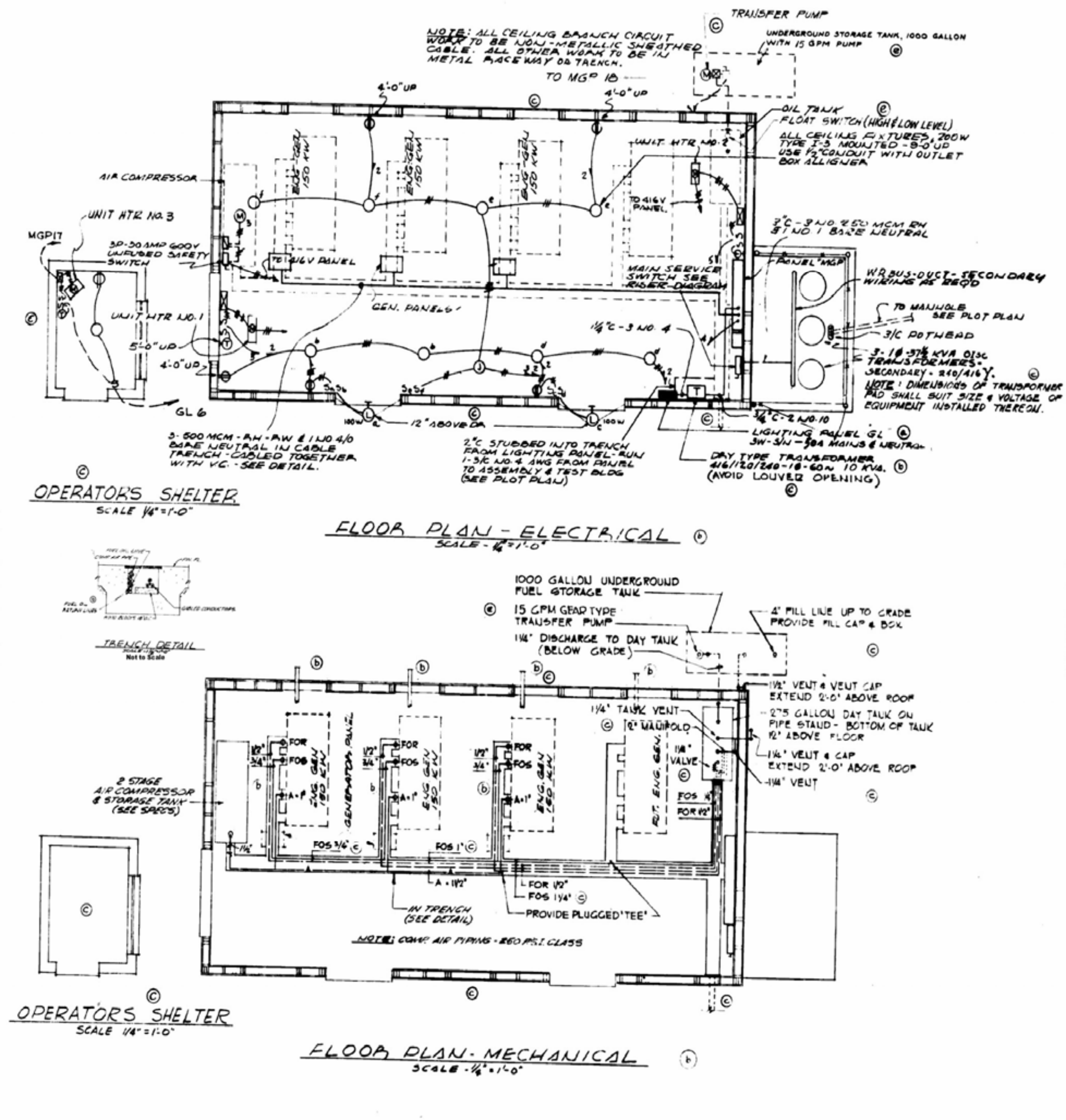


Figure 4-2e: Launch Area Generator Building (ME 26-03-40)

4.3 Service Area

The service area was used to install the rocket motor subassembly, to install the warhead body section, and to assemble the rocket motor cluster. Specific information for assembly and test operations of the missiles performed in the service area is described later in this section. The service area contained the Nike Ajax fueling station, the joining or warheading building where the Nike Ajax booster or Nike Hercules rocket motor cluster was joined to the missile body and the warheads installed, and/or the Nike Hercules rocket motor cluster assembly area. The service area was located between earth revetments approximately eight to ten fee high, at a safe distance from the assembly building, as prescribed in the Ordnance quantity-distance tables. TM 9-1450-250-12 at 6.

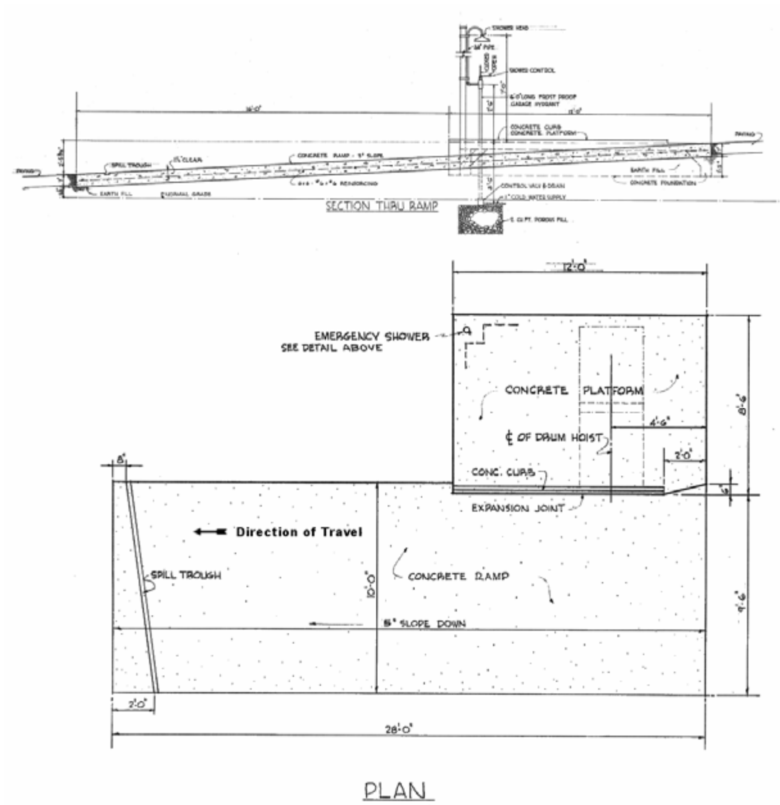
4.3.1 Nike Ajax

4.3.1.1 Acid and Propellant Fueling Station

Fueling of the Nike Ajax was performed at two fueling station arranged in series. The missile was tilted by a 3^o to 5^o ramp/bump built into the acid fueling station. The M2 acid platform hoist assembly automatically inverted the barrel as it was raised to provide a 60-inch head between the acid drum and acid port on the missile body. As protection against the caustic acid, crewmen wore disposable protective clothing and breathing apparatus during the fueling process. An emergency shower was provided at the acid platform.[8] See Figures 4-3a and 4-3b. Propellant fueling followed the acid fueling. The M3 fuel hoist was a crank-operated lift approximately 12 feet high. The fuel was hoisted onto this platform, allowing the fuel to flow into the missile by gravity. The propellant fueling ramp and platform were similar but no shower was provided or acid neutralization pit was provided at the propellant station. Both ramps were constructed with a built-in spill trough. TM 9-1450-250-12 at 6; TM 9-5012-1 at 197-199, 202, 208; MS-70 Drwg.

Figure 4-3a: Nike Ajax Acid

[8] References to an "acid neutralization pit" near the acid fueling station on drawings for Nike Ajax sites, however, no drawings or references to this pit have been located.



Fueling
Figure 4-3b: Typical Acid Fueling Ramp and Platform
(Note: Propellant Ramp and Platform was similar)

4.3.1.2 Acid Storage Shed

The acid fuel was stored in a shed located at the end of the curved walkway outside the bermed fueling station. Shower facilities were provided near the acid storage shed in the event of accidental contact with dangerous chemicals and fuels. Whitacre, 1996 at 64; MS-70 drawing.

4.3.2 Warheading Building

Except for the safety and arming devices and rocket motor igniter installed in the launching area, the missiles explosive components were installed in the warheading building. The warheading followed the propellant filling for Nike Ajax missiles. The warheading building may also have been referenced as a joining building at some Nike Ajax sites. The drawings for these two buildings are similar in functional space. The heating drawings show an aboveground fuel oil tank a buildings TM 9-5012-1 at 219; Whitacre, 1996 at 65-66.

The service area was used for unpackaging and assembling the rocket motor, unpackaging, assembling, and installing the warhead and missile rocket motor in the missile, and performing the continuity tests of the rocket-motor initiators, and safety and arming (S&A) devices prior to installation. FM 44-82 at 22.

The joining and/or warheading building provided a protective shelter during the uncrating and installation of the warhead body section and for the installation of the missile rocket motor subassembly. A separate heater room with an exterior above ground fuel oil tank is shown on the standard drawings. TM 9-1450-250-12 at 6; ME 33-38-10 Sheet 1 & 4; ME 35-60-05 Sheet 1.

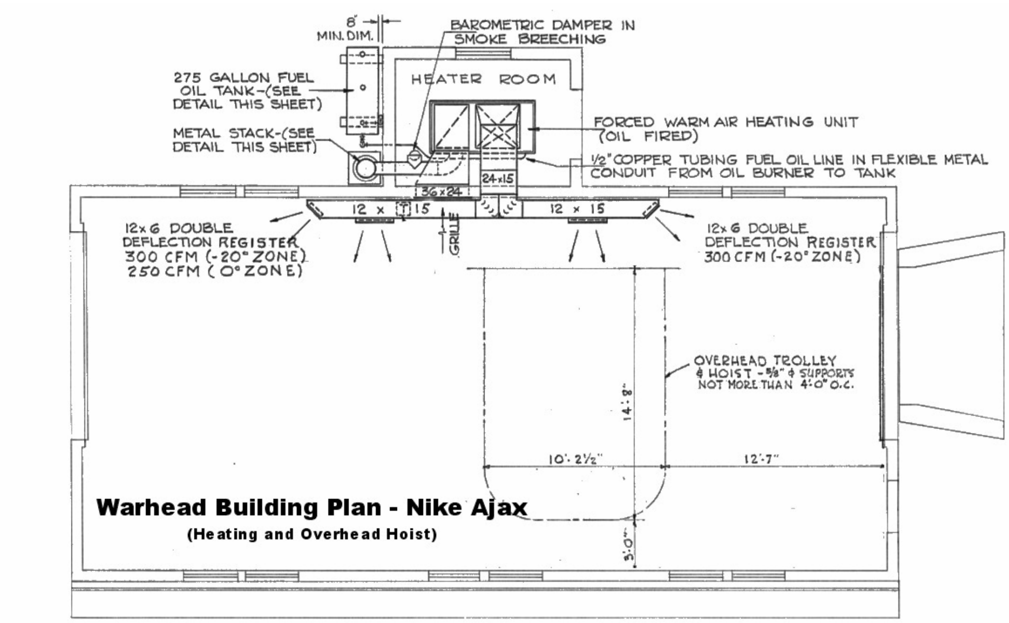


Figure 4-3c: Warheading Building

4.3.3 Rocket Motor Cluster Assembly Area

The rocket motor cluster assembly area for the Nike Hercules was located in the service area and used for uncrating and assembling the rocket motor cluster. TM 9-1450-250-12 at 6.

4.4 Launching Area

The launching area contained equipment necessary to relay command and data signals between the radar course-directing central, missiles, missile launching equipment, a trailer mounted launching control station and three launching sections. Each launching section contained four monorail launchers arranged in various patterns depending upon location and terrain. A brief summary of basic items of equipment is presented below. PAM 750-1-2 at 28.

4.4.1 Trailer-Mounted Launching Control Station (LCS)

Trailer Mounted Launching Control Station was the central control station of the launching area. See Control Van Pad on Figure 4-1. It contained the necessary controls, indicators, and communication equipment for control of the launching sections and it relays tactical launching area information received from the launching sections to the battery control area. The major components within this station are:

- The launching control console.
- The upper and lower manual switch- board SB-22/PT
- The main switchbox
- Five utility storage cabinets
- The personnel heater
- The operational status display board, and
- The flight simulator group (PAM 750-1-2 at 28)

4.4.2 Monorail Launcher

The monorail launcher, constructed of welded steel beams, consisted of the basic structure, erecting beam, loading and storage racks, four test stations, a launcher control indicator, and electrical and hydraulic power units. The monorail launcher is used in conjunction with the launching and handling rail as a firing platform for the missile and it serves as a test station for missile pre-firing tests and operations.

The erecting beam was raised or lowered by means of hydraulic pressure from the hydraulic power package. The beam was used to support the launching and handling rail and it contained one of the launcher's four test stations. Loading and storage rack sections extended from each side of the monorail launcher. The three sections on the left side of the launcher were used as storage and test stations for the missiles. The two sections on the right side of the launcher are used for storing the launching and handling rails after the missiles have been fired, and they are used to store rejected missiles until they are transported to the assembly and service area.
PAM 750-1-2 at 30.

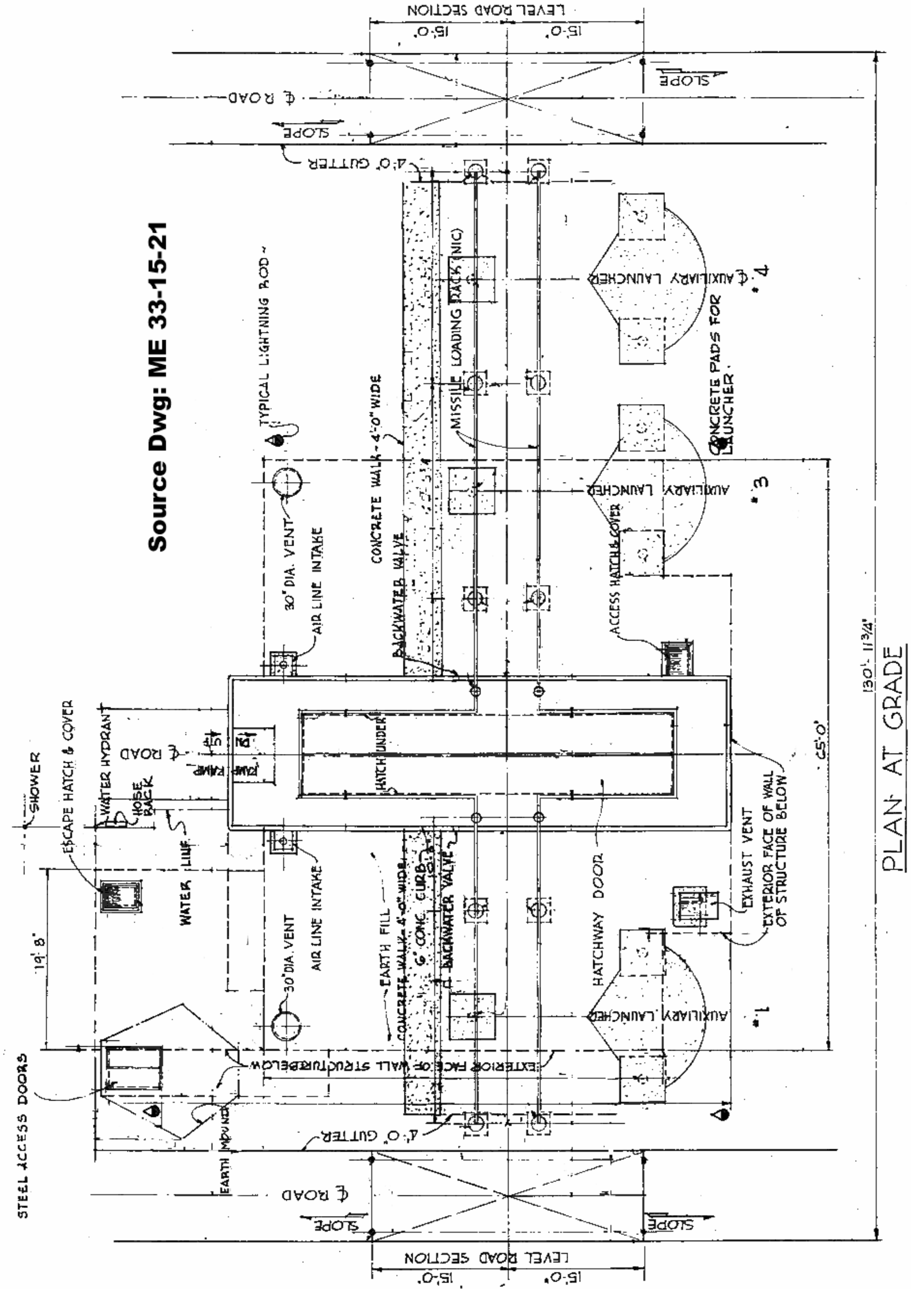


Figure 4-4a: Typical Magazine Surface Configuration

4.4.3 Launching and Handling Rail

The launching and handling rail supports the missile body and booster combination on the loading and storage racks. It transports the body and booster combination on the monorail launcher, holds them in firing position on the erecting beam, and provides a track for the missile body and booster combination on the lift-off.
PAM 750-1-2 at 30.

4.4.4 Underground Storage Magazines and Launcher-Loader Assemblies

The central feature of the launch area was the underground magazine and its associated launcher-loader assembly. Storage racks held the missiles in the underground area using a system of locking pins. The missiles were rolled to the elevator and on to the elevator launcher. The first temporary Nike Ajax sites featured above ground storage and launchers but use of space-saving underground magazines were the norm[9]. The Nike Ajax magazines housed twelve (12) missiles each while eight (8) Nike Hercules could be stored in magazines.[10] The missiles were lifted to the surface in a horizontal position by means of a hydraulic elevator and manually pushed along the launch rails to one of the launchers. The launcher elevated the missiles to an angle of 88 degrees for launching. This angle prevented the booster to from falling back on the launch area. During a launch, the crew took their positions in a small personnel room located behind three blast-proof doors. This room included a console from which the crew could fire the missiles in an emergency. Lonnquest, 1996 at 173; NPS1 at 5; Westec, 1987 at 51

Sub-Surface elements of the magazine included:

- Portable equipment dollies.
- Electrical cable assemblies.
- Hydraulic and air pressure lines.
- Entrance hatches.
- Loading-rack adapters and fin storage racks.
- Elevator assembly with hydraulic power unit.
- Dehumidifiers and exhaust system, and
- Deluge shower. PAM 750-1-2 at 46.

[9] An underground magazine configuration was used to limit the land requirement to approximately 40 acres. Although there were exceptions, such as the outdoor and above ground Hercules configuration used at SAC bases, Hawaii and Alaska, the underground magazines were used in most cases. “New sites, located away from populated areas did not have to be confined in acreage. Consequently, these batteries were all above ground with missile storage and maintenance facilities located behind earthen berms.” Lonnquest, 1996 at 171-172, 181-182.
[10] The number of Ajax that could be stored underground was dependent upon the number of missiles that had booster fins removed to allow a "tighter" storage. Typically some were that way but others (in each magazine, or pit) had to be ready. If booster fins were removed, a crew had to demonstrate proficiency in reattaching them during drills so that the battery's rate of fire was not compromised.

During conversion from Nike Ajax to Nike Hercules, the sites underwent modifications so the new missiles could be serviced and stored. The Ajax magazines and elevators were too small for the larger Hercules so new structures were designed. These became universal magazines capable of holding Ajax or Hercules. The larger size of the Nike Hercules reduced the capacity of the underground magazine's to eight missiles and storage racks, launcher rails, and elevators underwent modification to accept the larger missiles. Table 4-1 compares magazines. Lonnquest, 1996 at 178-179, 182; Cole at 249-250.

Table 4-1
Nike Site Magazines*

Type Magazine	Designed for:	Launcher on Elevator	Pit Length	Pit Width
A	Ajax	Yes	42 feet	63 feet
B	Ajax/ Hercules	Yes	49 feet	60 feet
C (A converted to N-H)	Hercules	No	42 feet	63 feet
D	Hercules	Yes	62 feet	68 feet

Source: www.homestead.com/nenike1/files/niketech.htm

Each magazine had an associated launch pad with blast deflector, access areas, and ground electrical units. The magazine pad had a double elevator door, which swung down to open. Stairways led to the double-door main entrances to the magazines. Access to many Nike magazines was via armored hatches, vertical ladders and/or staircases in later additions. Emergency escape hatches, with counter-weights for easy opening, led from the underground personnel rooms to the outside. The magazines were made of reinforced concrete; fresh air was provided via a ventilation unit. Each unit also had several ventilator shafts. Whitacre, 1996 at 66.

The escape hatch covers and miscellaneous controls were operated by 100-150 psi Diesel engine air compressor. AR 750-530 at 6.

Each underground unit contained a room for storing the missiles (the magazine room), an elevator to carry the missiles to the surface for firing, and four launcher-loader assemblies. Three of the launchers were permanently emplaced above the ground. The fourth launcher was mounted on the elevator. The launchers were equipped with electrical and hydraulic equipment needed to conduct prefiring missile tests and to erect a round for firing. Signal circuits, control circuits, and two-way voice communications systems were provided. Nike crewmen could operate the elevator, which could be raised, lowered, or stopped, via a master control station in the magazine room, from the controls on the elevator, or from the launching section control panel in the personnel room. Hydraulic power operated the elevator, and an elevator assembly power unit supplied power to the doors in the magazine room. Whitacre, 1996 at 66; FM 44-82 at 17.

The Section Control Indicator Group consisted of an indicator with the necessary switches, indicator lights, meters, and communication equipment required for preparing the missile fire and launch order circuits for coordinating activities of the launchers with the launching control group. The Section Simulator Group received the 208-volt AC and 24-volt DC power from the launching section generator. It then supplied power to each launcher in the section, to the launcher control-indicators, and to the launching section control-indicator. PAM 750-1-2 at 30. Pipe drains that could daylight to meet ditch grade or empty to a French drain system drained the magazine sump and access doors.

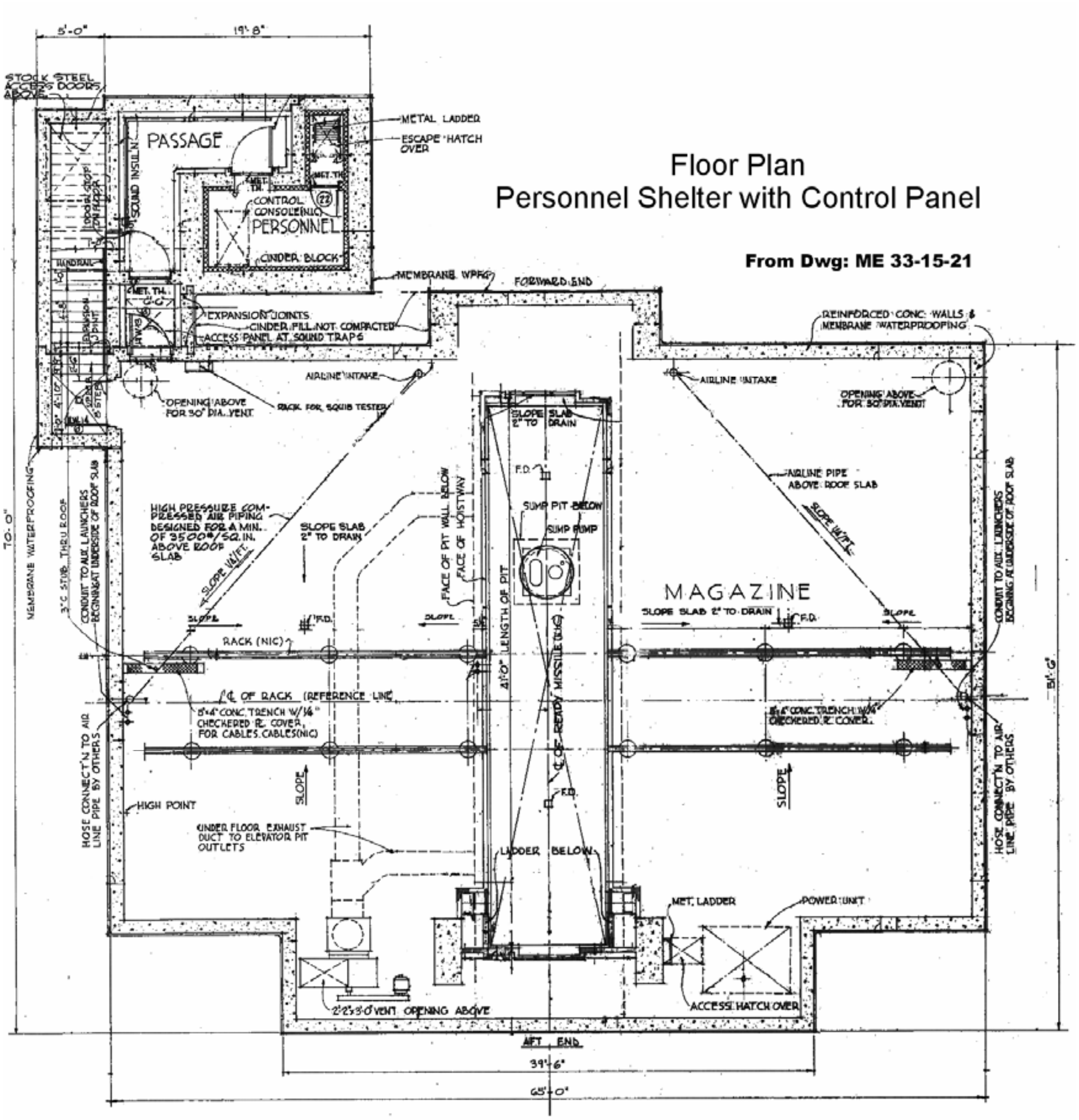


Figure 4-4b: Typical Magazine Underground Configuration

4.5 Maintenance Operations

4.5.1 Service and Handling Equipment

When the service and handling equipment was received at the battery site, organizational maintenance personnel inspected all assemblies, subassemblies, repair parts, and tools to determine that the equipment was properly assembled, cleaned, correctly adjusted, and lubricated. The apparent physical and operating condition of the equipment was determined by a visual inspection and review the logbook. A complete physical inspection was performed. Lubrication or maintenance to be performed before assembling and adjusting the parts was accomplished. Once emplaced the equipment was electrically and mechanically checked and aligned, as applicable. Disassembly and assembly instructions enabled the using personnel to clean, inspect, lubricate and replace allocated repair parts when required.
TM 9-1450-250-12 at 13.

Specific abrasive, cleaning, preserving, and related materials for painting were provided in technical manuals. The precautions below were to be observed:

- Before painting in the vicinity of grease fittings, cover the fittings with masking tape.
- Identifying characters or numbers obscured during painting must be re-placed as soon as possible.
- All cleaning, painting, and stenciling procedures were performed in a well-ventilated room or outdoors with a CO_2 fire extinguisher nearby.
- Corroded or chipped surfaces were cleaned with a carbon scraper and smoothed with a 1/0-80 grade abrasive cloth.
- Oil and grease were removed by wiping with a clean wiping rag moistened with volatile mineral spirits paint thinner or dry-cleaning solvent[11]. The surface was washed with clean water and allowed to dry.
- Paint was issued ready mixed to proper consistency and thinning was not necessary.

TM 9-1450-250-12 at 41.

Each Hercules missile had an internal auxiliary power system (APS) or a hydraulic power unit (HPU). Clean oil for these units was provided by a portable hydraulic oil fill and filter unit and was used for filling and bleeding the system. The hydraulic oil was purged from the unit when changing from one type of oil to another type or prior to performing maintenance procedures on any hydraulic component. The portable unit operated using quick-disconnect fittings. The portable oil fill and filter unit power cable assembly was connected to a 208-volt, 400 cps, 3-phase power source, and operated until the oil flow stopped. TM 9-1450-250-12 at 12 & 66.

[11] The dry cleaning solvent specified was P-D-680 Type 1, a petroleum distillate.

4.5.2 Preventive and Organizational Maintenance

Preventive and organizational maintenance was a function of the using organization performed by the operator or the organizational maintenance crews. Inspection and preventive maintenance was performed at specific intervals. Inspection and preventive maintenance of equipment included lubrication, painting, cleaning, missing or damaged parts, signs of leakage and organizational maintenance of the equipment systems. TM 9-5016-2 at 137.

General information for lubrication calls for the use of clean lubricants and hydraulic fluids for proper functioning of the materiel. Lubrication orders prescribed the appropriate cleaning and lubrication.

Launcher-loader lubrication:

- Cleaning of lubricant fittings was accomplished with **mineral spirits**.
- Daily inspection of the launcher-loader hydraulic reservoirs was specified to ensure operational readiness. These reservoirs used **hydraulic fluid MIL-H-5606**. Two types were available depending upon the outside temperature.
- The hydraulic fluid level in the launcher shock strut was checked monthly. The strut also used MIL-H-5606 hydraulic fluid.
- The hydraulic fluid was to be drained every three months or more frequently under dusty conditions or when ever contamination was suspected. The draining of the reservoirs drained into containers.
- Painting of exterior surfaces included removal of oils and greases by wiping with cloths moistened with **trichloroethylene**. TM 9-5016-2 at 110-111, 114, 117, 132.

Due to concern for malfunctions of launching equipment caused, periodic cleaning of all components were recommended. **Trichloroethylene** was recommended for removal of grease and oil from system components. As with the radar filters discussed in Section 3, the filters for the launching control group, power simulator group, flight simulator and launcher interconnecting box were cleaned in a 2-inch deep bath of **trichloroethylene** and recharged with OE-10 or OE-30 engine oil. These filters were a matter of a few inches to about 12-inches square in dimension. TM 9-5016-2 at 133-135.

Other authorized cleaning materials were listed in ORD 7 Standard Nomenclature Lists (SNL) not located as of this writing. TM 9-5016-2 at 133.

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4.6 Nike Missiles

Figures 4-6a and 4-6b illustrate the explosive and fuel components of the Nike Ajax and Nike Hercules.

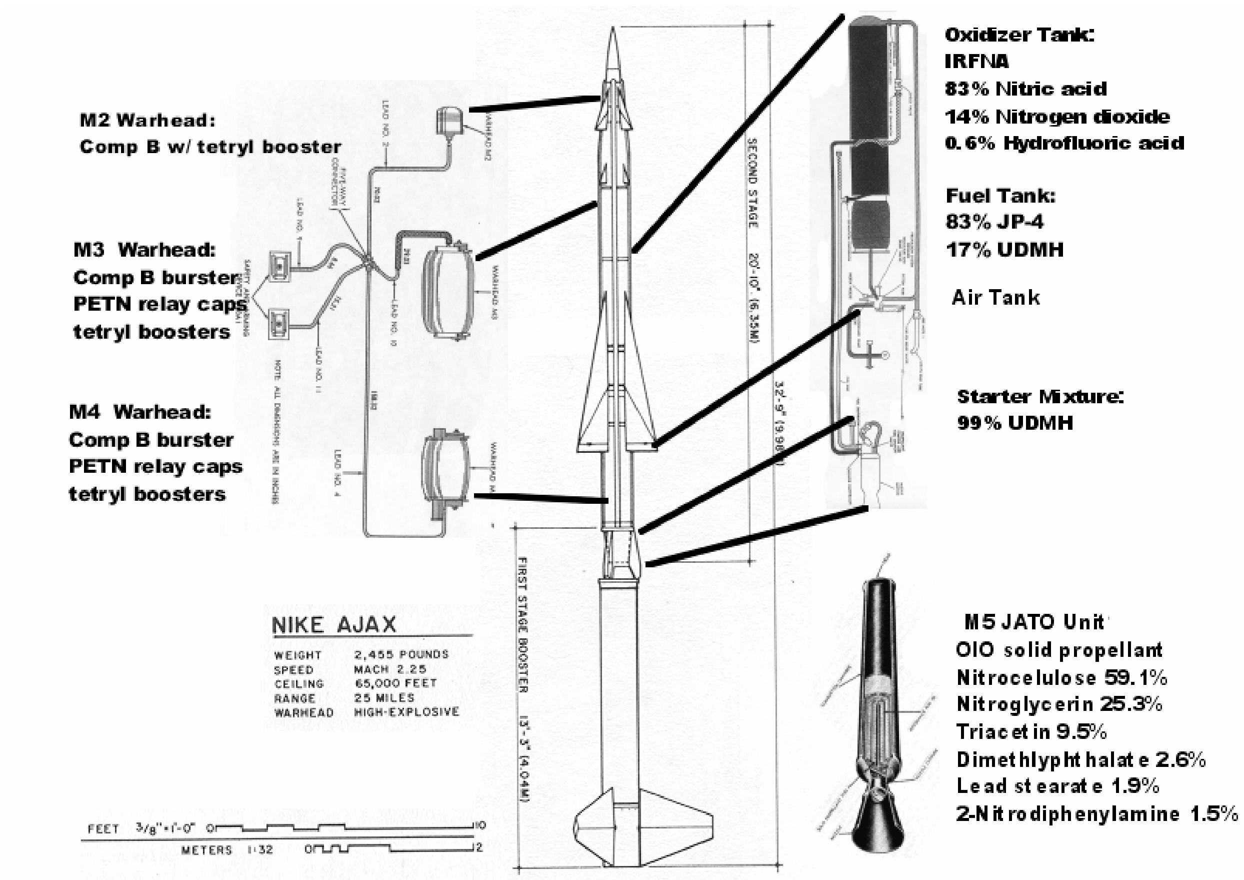

Figure 4-6a: Nike Ajax Missile and Booster

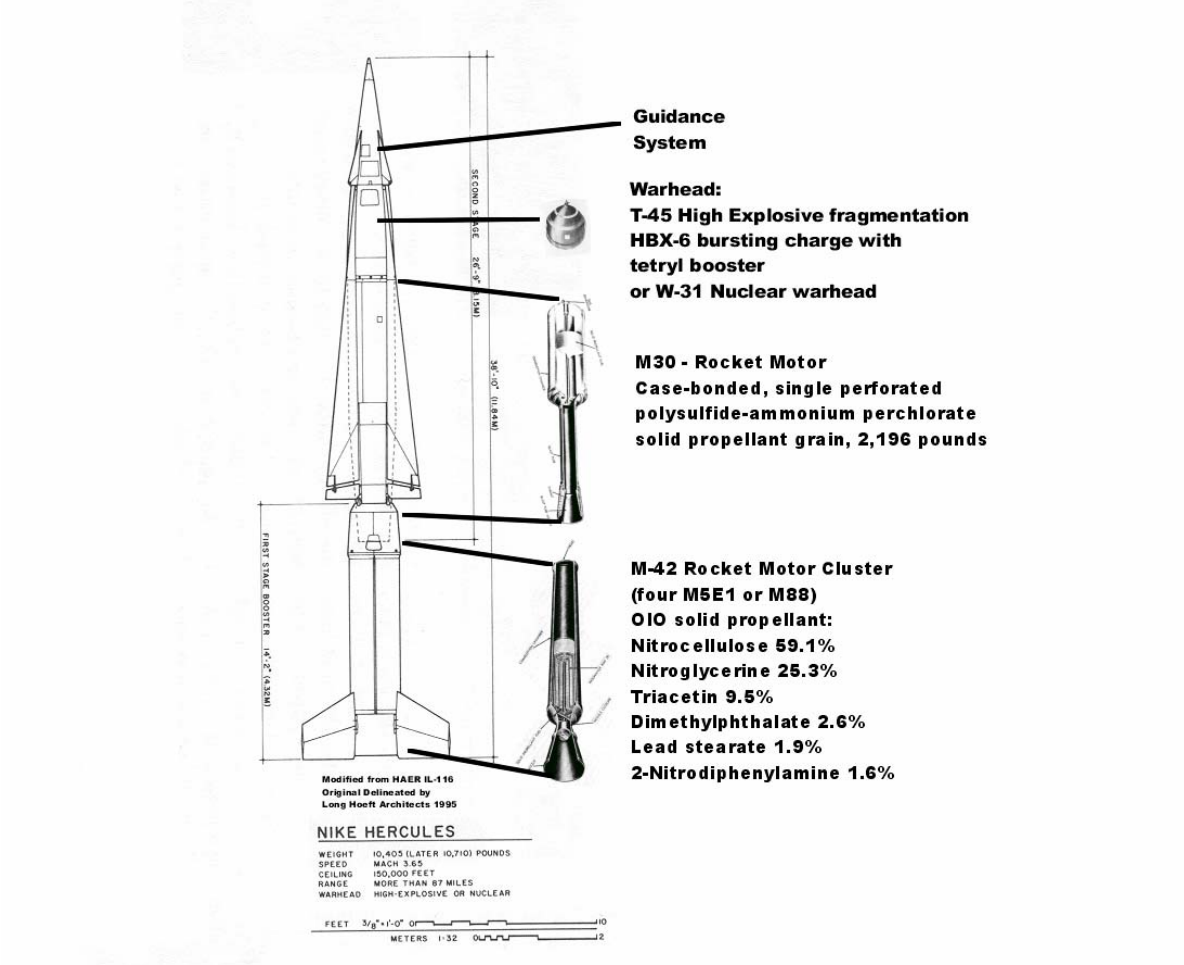

Figure 4-6b: Nike Hercules Missile and Booster (TM 9-1385-51)

4.6.1 Nike Ajax

4.6.1.1 Missile Assembly Process

The missile component parts were received and inspected, assembled, tested or checked and adjusted, sent to the service area for fueling, warheading, and joining, ultimately sent to the underground magazines. The variations between the Nike Ajax and the Nike Hercules missiles and boosters account for certain differences in the assembly procedure, however, the nature of the assembly operations aside from the fueling of the Nike Ajax follow a similar sequence. TM 9-1410-250-12/1 at 3-4.

Periodically, missiles were disassembled and returned to the direct support or general support field maintenance shops and depots for more detailed maintenance, service checking or repair. It is estimated that approximately 30 missiles per year were sent from the battery to the battalion support shop. Approximately 10 missiles per year were sent from a particular battalion to a depot. Any shipping of the missile required disassembly into its 13 component parts, packed in its original crates, and shipped. Disassembly was accomplished at the battery missile assembly building. It was also common practice to randomly select certain missiles to be returned to one of the depot areas for more complete maintenance and service checking operations. The depots were located at Letterkenny, Pennsylvania; Tooele, Utah; and Pueblo, Colorado. [12]

4.6.1.2 Assembly and Service Operations

The details of the assembly of the missiles as well as chemicals used are discussed in the technical manuals. See Figure 4-6c & d for the assembly process overview. Pertinent uses of chemicals are presented in the following paragraphs.

The component parts and the rocket motors were shipped to the battery sites in wooden crates and packing boxes. Missile bodies and guidance systems were shipped in metal container pressurized with 5-psi dry air and desiccant to protect against dampness. The Nike Ajax starting mixture, **unsymmetrical dimethylhydrazine (UDMH),** was packaged in aluminum bottles encased in a heat-sealed envelope while the other liquid propellants (oxidizer and propellant mixture M3) are aluminum drums. These shipping containers were inspected for condition and evidence of tampering. TM 9-5012-1 at 66-76.

Pressurized containers required depressurization prior to removal of the missile body. The missile body was handled by the use of handling rings, manual lift trucks and mobile cranes. The shipping container and missile body were inspected for evidence of hydraulic accumulator leaks. All components were inspected for paint condition or bare spots, dents, cracks, bent and broken parts, moisture and corrosion and other damage. TM 9-5012-1 at 83, 87-88.

[12] Included for information purposes only, taken from Louisville District Nike history report but not citations to source document was provided and writer was unable to verify. The "support plan" names additional depots.

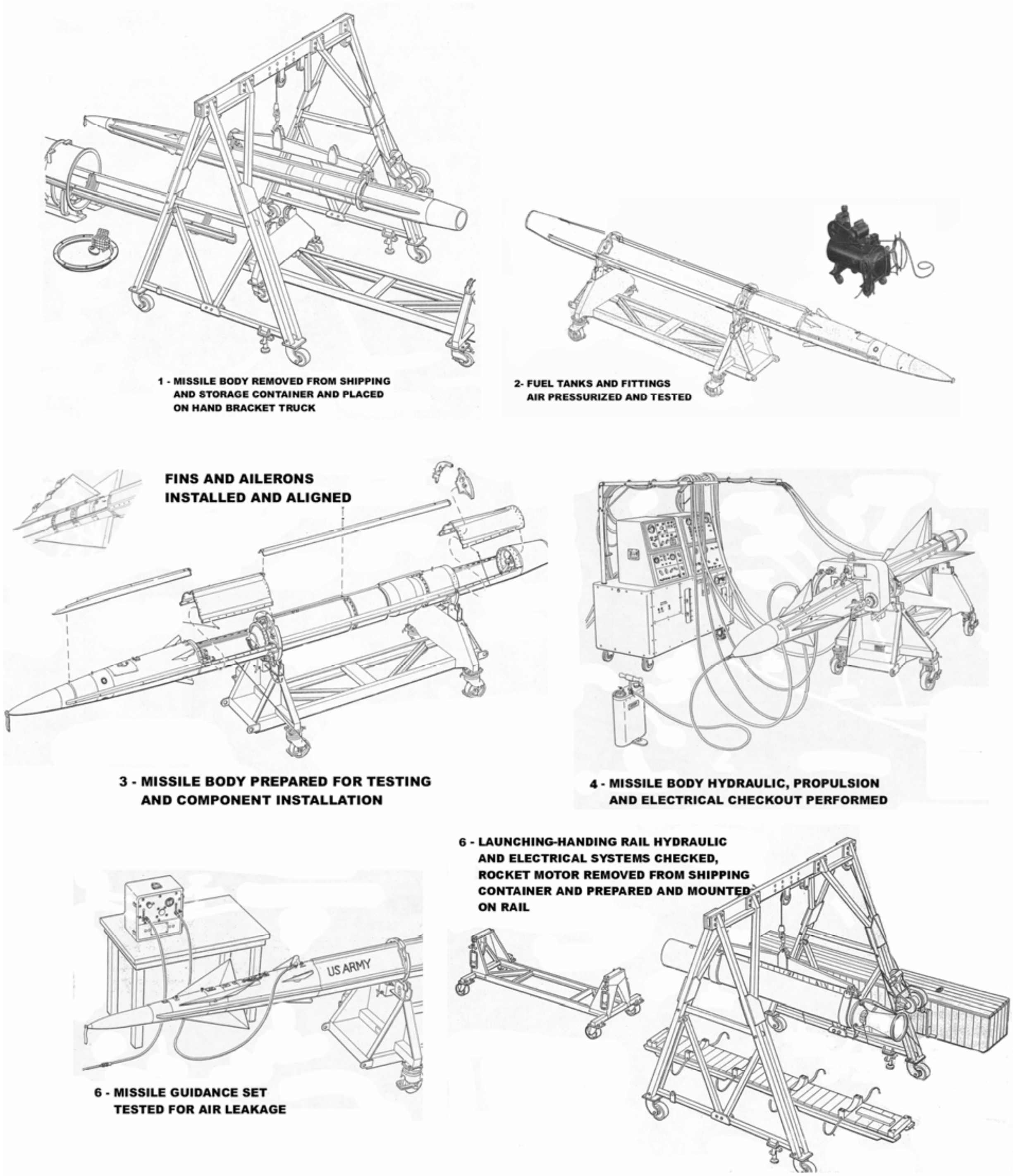

Figure 4-6c: General Nike Ajax Assembly Process Steps 1-6

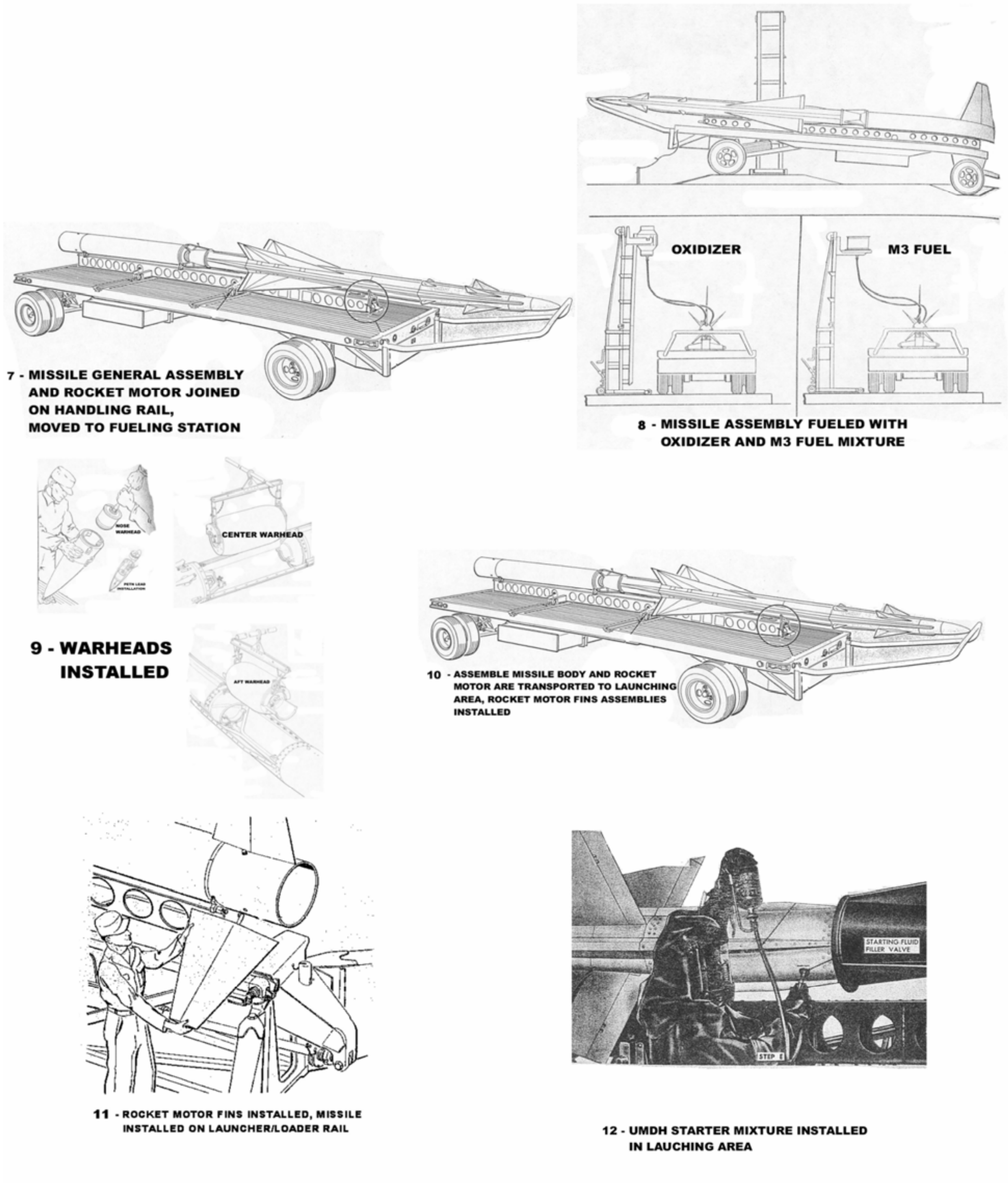

Figure 4-6d: General Nike Ajax Assembly Process Steps 7-12

The corrosion-preventive compound was removed from unpainted surfaces of the Nike Ajax missile stabilizer fins with **trichloroethylene**[13]. A similar requirement for cleaning the booster fins appears later but does not specify what to use. TM 9-5012-1 at 89, 180.

For shipment, the oxidizer, starting fluid, and fuel tanks were filled with pressurized nitrogen. Air pressure readings were taken for the oxidizer, starting fluid, and fuel filler fitting to assure the systems did not leak. If leakage had occurred and the maintenance needed was beyond the scope of the organizational maintenance, the missile body was referred to higher echelon for repair. These tanks and lines were depressurized during assembly. TM 9-5012-1 at 91, 96-97.

High-pressure air and high-pressure hydraulics were integral to the missile body propulsion and steering systems. TM 9-5012-1 at 110-111.

The missile body was prepared for installation of the components. The assembly process was primarily a mechanical process with select moving parts such as aileron pin assemblies receiving lubrication. The missile batteries and other electrical components were tested for proper connection and sensitivity. TM 9-5012-1 at 109-110.

The hydraulic accumulator pressure and hydraulic system is checked and inspected at the assembly stage. The hydraulic accumulator could be drained for replacement or substitution of hydraulic fluid. With the hydraulic pressure line plugged and a drain line attached from missile to fluid receptacle, air pressure is applied to drive the accumulator piston back until the one (1) gallon of hydraulic fluid is forced out. Standard missile **hydraulic fluid MIL-O-5606** was red in color but could be replaced by yellow or amber colored low-temperature **hydraulic fluid GB-104-566** when sustained temperature of –50^{o}F is expected. TM 9-5012-1 at 115, 247.

After completion of the assembly area electrical checkout, the missile guidance set was pressurized and checked for leaks. The missile body was also pressurized and inspected. TM 9-5012-1 at 123, 161.

As with the missile, the launching, handling rails and rocket motor were inspected for damage, dirt, corrosion, excessive paint and grease. Moving parts were checked for proper function and lubricated as needed. The rocket motor was also prepared for joining to the missile. The visible portion of the propellant grain structure was inspected for cracks, evidence of moisture and unusual discoloration. TM 9-5012-1 at 162-164, 175.

The rocket motor was installed onto the launching and handling rail. The missile and rocket motor are then joined. The missile is then ready for fueling. TM 9-5012-1 at 180-182.

[13] August 1961 Change three to TM 9-5012-1 specified **trichloroethane** as the replacement for trichloroethylene for this service.

4.6.1.3 Fueling

Fueling operations for the Nike Ajax sustainer motor were conducted in the revetted, joining or service area with the missile installed on a launching and handling rail. These operations involved handling of the **Inhibited Red Fuming Nitric Acid – IRFNA oxidizer, propellant mixture (M3), and UDMH starting mixture**. Handling of fuels required use of disposal protective clothing and breathing apparatus that was worn during the fueling operations. Decontamination of propellant mixture and UDMH consisted of neutralization using **5% acetic acid** while IRFNA was neutralized with **5% sodium bicarbonate** solution. Both decontamination solutions were followed by rinses of soap and water. Unserviceable clothing and equipment was decontaminated and turned in through normal supply channels for repair or replacement. TM 9-5012-1 at 194-197, 211.

The IFNRA oxidizer was furnished in drums. During the filling operation, the drum was lifted to provide a 60-inch head between the bung and the top of the missile oxidizer tank. See Figure 4-4a and Figure 4-10b, Step 8. The drum was elevated to take all sag out of the tube. The missile was tilted 3 to 5 degrees by a ramp built into the fueling station at permanent battery sites. Sealed connections were made between the drum and missile. To protect the missile from spillage, a splash pan with drain line was attached between the missile body and the oxidizer fill line and the oxidizer vent and drain line. Both lines were connected to the missile by threaded coupling. Any spillage on the missile was wiped off or neutralized with a rag soaked in **10% sodium bicarbonate** solution. Pressure on the oxidizer drum was relieved with any spillage neutralized with a rag or sponge soaked 10% sodium bicarbonate solution followed by a thorough flushing with water. Upon completion of filling[14], the missile and oxidizer drum tubing were disconnected, splash pans removed and any spillage was flushed with water. TM 9-5012-1 at 197-199, 202, 208.

If the missile was overfilled, the excess oxidizer was removed by aspiration through the oxidizer vent. Aspiration was conducted by use of a probe and polyethylene bottle to capture oxidizer. The excess oxidizer was emptied into a suitable oxidizer disposal container and the probe was decontaminated and **disposed in accordance with existing military directives**.[15] TM 9-5012-1 at 209-210.

The fuel filling procedure was performed after the oxidizer filling procedure. The M3 propellant mixture was furnished in pre-metered aluminum drums containing 48.5 to 49 pounds of fuel. The procedures were the same as those for the oxidizer described above utilizing the fuel vent and fuel filler connections. Water and dilute ascetic acid was used for neutralization and

[14] Following the proper filling procedure cleared oxidizer from the vent tube and provided rapid flow of the oxidizer. The oxidizer and propellant mixture filler nozzle were internally stoppered. If the stopper was pushed through the filler into the oxidizer tank, the missile was defueled and repaired at a higher echelon. TM 9-5012-1 at 208, 217.

[15] No disposal directives were located.

decontamination of any drips or leaks from the fuel drum, fueling area and aspirator. Decontamination of the missile components was accomplished by wiping with a rag soaked in **ethyl alcohol** and a water rinse. The fuel drums were not returnable. TM 9-5012-1 at 211, 218-219.

To prevent overfilled, the tube between the fuel container and fuel vent was left connected and the drum was lower. Excess fuel drained to the container when the missile was leveled. The propellant weight is then determined and if greater than specified the excess was aspirated. The aspiration process was not needed on previously unfueled missiles. TM 9-5012-1 at 217-218.

4.6.1.4 Warheading

Except for the safety and arming devices and rocket motor igniter installed in the launching area, the explosive components were installed in the revetted area or joining or service area following the propellant filling. Any defective parts are replaced, not repaired. TM 9-5012-1 at 219.

The explosive harness assembly (M45) contained 5 aluminum-encased PETN relays on the end of each lead. These leads vary in length according to warhead or safety and arming device served. These were installed with finger tight connections whose threads were covered with a thin film of silicone compound. Initiators are installed into the three high explosive warheads and the warheads are installed into the missile. A PETN relay cap is connected to the nose warhead. The disposal of PETN relays caps was done in accordance with TM 9-1903, TM 9-5012-1 at 222, 228-229, 398.

4.6.1.5 Launching Area

After fueling and warhead installation, the missile was transported to the launching area and transferred to the storage racks in the surface or subsurface magazine. The missile already mounted on the launching and handling rail is aligned with positioned onto storage handling rack. Once on the handling rack, a thin film of general purpose lubricating oil applied to the fin mounting holes on the M5 rocket motors and the fins were installed. The missile is then rolled onto the launcher-loader erecting beam. TM 9-5012-1 at 233-234.

The rocker motor igniter was installed and the booster was in firing condition. Prior to installation, the igniter was inspected for corrosion. If corrosion existed, the igniter was removed to an approved location. The corrosion was removed utilizing **copper wool or aluminum wool** so no static electricity is generated. The effected area is painted with **fungus-proof varnish** where appropriate and **corrosion-preventive compound** was applied. Cleaning of threads was to be accomplished with non-ferrous wire brushes. The use of solvents that might affect the plastic igniter cap or its seals was prohibited. TM 9-5012-1 at 235, 237.

The battery was installed and final connections to the launching and handling rails were made, including inserting the hydraulic quick disconnect connector into the missile body. This connector was lubricated with the same **hydraulic fluid MIL-O-5606** as used in the missile hydraulic system. This fluid change could be done as needed in the launching area. TM 9-5012-1 at 237, 239-240, 247.

Starting Mixture: The insertion of the starting mixture was performed at the launching area with the missile installed on the launcher-loader[16]. TM 9-5012-1 at 240.

The **starting mixture (UMDH)** was furnished in pre-metered aluminum bottles. Protective clothing was required. Unlike the oxidizer and propellant mixture, the missile was maintained in a horizontal position for the insertion of the UMDH. Starter fluid vent and filler valves were provided and the small bottle was elevated manually. The transfer of the fluid from bottle to missile took about 30 seconds. Any fluid left in the transfer tube was drained back into the bottle. The bottle was to be **disposed of in accordance with local policy**. Flushing, wiping or wetting with alcohol or water decontaminated and neutralized of the filling probe, vent spike, missile components and any spillage. TM 9-5012-1 at 240-242.

The safety and arming device was installed as a complete unit and tightened into place with self-locking nuts. The missile is now ready to be placed on rails for storage in the underground magazine. TM 9-5012-1 at 243.

4.6.1.6 Depreparation

Depreparation (deactivation) of the missile was usually required when high pressure air, propellant, or hydraulic fluid leaks developed, or if a malfunction was detected during monthly electrical and hydraulic checks, or in preparation for shipment or storage. TM 9-5012-1 at 251.

Depreparation was a mechanical procedure conducted in the sequence outlined below. Uses of lubricants and/or chemicals are noted: TM 9-5012-1 at 251, 252.

- The rocket motor igniter was removed from rocket motor;
- The safety and arming harness was removed while in the launching area;
- The missile body air storage tanks for the propulsion system and hydraulic system were depressurized. **Hydraulic fluid MIL-L-4343A** was used to lubricate the depressurizing air valve plunger.[17] TM 9-5012-1 at 252.

[16] Local policy may dictate insertion while the missile was on the handling rack. TM 9-5012-1 at 240.
[17] March 1961 Change one to TM 9-5012-1 called out **T-film sealing compound** to replace MIL-L-4343A.

Removal starter mixture (UDMH)[18] was conducted while the missile was elevated at 15 degrees on the erecting rail. The starter fluid was drained into a bottle by way of a drain adapter and hose. Alcohol and water were used to flush the drain and vent hoses, wipe down any contaminated missiles parts, and neutralize any spillage. Drained started mixture and any contaminated water was **disposed of according to local Standard Operating Procedures**. UDMH could also be neutralized for disposal purposes with **dilute sulfuric acid**. TM 9-5012-1 at 255, 257, 397.
The missile was removed from the launcher-loader rail after removal of the starting mixture. The storage battery then removed and the missile was transported to the revetted, joining or service area. Removal of the explosive harness assembly and warheads was accomplished in the revetted, joining or service area while the missile was stilled installed on the launching and handling rail. TM 9-5012-1 at 257-259.

The missile body was then disjoined from the rocket motor thrust ring and rocket motor followed by removal from the launching and handling rail and removal of the propellants. This propellant removal procedure began with an inspection for any leaks. Leaking propellant was drained first. A vent hose assembly provided primary venting during the draining process. A warning that oxidizer fumes may be visible as a reddish-brown haze extending 3 to 5 feet from the end of the vent line was included. The IRFNA oxidizer was drained into a clean, dry empty drum through vented drain hose that attached to the threaded oxidizer filler fitting. Personnel worn the protective clothing and followed decontamination procedures previously discussed. The missile was rotated to ensure all oxidizer was removed. **Non-oxidizing lubricant fluorolube**[19] was applied to the missile vent and filler fittings and drainage equipment threads after drainage was completed and before equipment storage. The recorded weight of the oxidizer drained must equal the weight of oxidizer recorded during filling operations. The drum was mark as contaminated. Affected missile components were decontaminated with **95% ethyl alcohol** and a water rinse. The area was decontaminated with dilute ascetic acid followed by a water rinse. TM 9-5012-1 at 261, 263-265, 267.

The propellant mixture M3 drainage and the decontamination process was the same as that described for the oxidizer. TM 9-5012-1 at 268-270.

Starter mixture line was dried using a pressurized air. The area was washed down with water. TM 9-5012-1 at 270.

4.6.1.7 Organizational Maintenance

Specialized tools, equipment and parts were issued to the using organization for operating,

[18] The original fuel of JP-3 and original starting fuel of aniline and furfuryl alcohol were replaced (the date was not given) in the Nike Ajax program with M-3 fuel and UDMH starting mixture. SAE Journal, 1958 at 40.
[19] March 1961 Change one to TM 9-5012-1 called out T-film sealing compound to replace Non-oxidizing lubricant fluorolube.

maintenance and assembly of the missiles and components and associated equipment. The parts consist of those replacement parts within the scope of the organizational maintenance functions likely to be come broken, worn or otherwise unserviceable. Tools were hand held pullers, screwdrivers, wrenches, electrical and pressure test equipment and hose assemblies. Equipment consisted of hoisting and handling equipment. TM 9-5012-1 at 271-289.

For normal cleaning of dirt, grease, and oil from the Nike Ajax guided missile, the use of one part **emulsion cleaner (P-C-576A, type 1)** with four parts of **dry cleaning solvent** applied by brush, mop or rag, followed solvent rinse and wiping dry was prescribed. TM 9-5016-2 at 135.

The organizational maintenance functions consisted of lubrication, painting, periodic preventive maintenance services, trouble shooting, and specified maintenance of the missile and the missile guidance system.

Aileron attaching pin assemblies required lubrication with **hydraulic oil MIL-L-4343A** while missiles from 7851 and beyond utilized **oilite** bearings and did not require lubrication. Threads of the rocket motor igniter required light lubrication with **corrosion preventive compound**. The igniter was removed every 6 months for thread cleaning, lubrication and reinstallation. TM 9-5012-1 at 291.

The external surfaces and markings of the missile body and rocket motor and external components were painted with one or two coats of **zinc chromate primer**. This surface was regularly inspected for oxidation, fungus or flaking. When found, it was cleaned and repainted in accordance with standard maintenance procedures. TM 9-5012-1 at 291.

Preventive maintenance conducted at specific intervals included checks, inspections, the missiles and systems for proper operation, security, pressure, and damage. The allocated tools and repair parts limited the preventive maintenance services of ready-storage missiles. Inspections for hydraulic and propellant leaks, or scratches, tool marks, paint flaking, or dents acquired during handling, testing, arming, propellant filling or storage were performed regularly. The booster rocket was also inspected for cracked solid propellants, effects of moisture, scratches, paint flaking, or dents. Launching and handling rails were inspected for proper lubrication. Moisture and dirt were removed with a clean rag, compressed air or an approved solvent, as necessary. TM 9-5012-1 at 291-292.

In the case of leaking propellant, depreparation procedures were performed and the missile body was referred to the next highest echelon. Damaged nose tips, steering fins, stabilizer fins, covers, and fairings were replaced at the organizational level. Safety and arming devices were removed and referred to qualified personnel. TM 9-5012-1 at 291-292.

Troubleshooting is the systematic isolation of malfunctions and defective components by observation of symptoms and tests. Troubleshooting included the propulsion system, hydraulic system and electrical systems and components. Tests and remedies were limited to the scope of the organizational maintenance. Unless within the scope of organizational maintenance, when leaks in the high-pressure air, propellant, oxidizer or hydraulic systems leaks developed or when electrical malfunction occurred the missiles were deprepared and referred to the next higher echelon. The complete missile electrical checkout was conducted in the assembly area as a series of steps performed in sequence. TM 9-5012-1 at 296.

Organizational maintenance repair of the missile body involved removal and installation of parts authorized in Standard Nomenclature List ORD 7 SNL Y-2. Removal of oxidizer and fuel lines required shipping the missile body to a higher echelon for flushing. No solvents or other chemicals were mentioned in the description of these replacements. TM 9-5012-1 at 326.

The organizational maintenance of the missile guidance system was as the replacement of parts listed in ORD 7 SNL Y-2 and the associated cleaning and inspection functions. Complete or partial disassembly of the guidance system may be required to perform particular maintenance functions. Due to high acceleration applied to the guidance system during trajectory, rigidly controlled procedures were necessary during maintenance. The guidance system must be secure and free of dust or dirt. The technical manual provides detailed handling, cleaning and inspection instructions. TM 9-5012-1 at 345-346.

Specific instructions direct cleaning bare metal parts that will remain disassembled for a long period of time with **trichloroethylene**. After cleaning the part was lubricated with a day-to-day **special preservative lubricating oil**. The oil was wiped off, the part cleaned with **trichloroethylene** and a permanent lubricant applied as required during the rebuild or repair. TM 9-5012-1 at 346.

Cleaning of a guidance system assembly or part included the removal of all signs of corrosion, dust, grit, grease, mold, fungi, or any other foreign substance. Specified methods of cleaning were dependent upon the material to be cleaned. Compressed air or dry brushes were used to remove loose dirt and grit. Soap and water were used on rubber compounds. Electrical wiring insulation was cleaned with a cloth moistened with denatured alcohol. Sandpaper or abrasive clothes were used to removed corrosion. Metal surfaces were cleaned with **trichloroethylene** or when all non-metal parts could be removed[20] and dip tanks available, **vapor degreasing with trichloroethylene** was recommended. The available information and drawings do not show a dip tank or vapor degreaser in any buildings. TM 9-5012-1 at 347.

4.6.1.8 Preparation for Shipment

Preparation of missile bodies, components and rocket motors for shipping required depreparation as described previously as well as handling and repacking the components. Potential solvent usage in the preparation procedure was the cleaning of the missile body, if necessary, along with the steering fins, stabilizer fins, ailerons, and rocket motor fins with **trichloroethylene**. Unpainted surfaces of the steering fins, stabilizer fins, and ailerons were also lubricated with

[20] Cleaning compounds were not to come into contact with rubber parts or electrical insulation. TM 9-5012-1 at 346-347.

general purpose lubricating oil. TM 9-5012-1 at 390-391.

Petroleum distillate (Stoddard solvent also known as dry cleaning solvent, Federal Specification P-S-661) was used to clean the containers for repacking missile bodies. TM 9-1970-2 at 35.

4.6.1.9 Destruction and Disposal of Material in the Zone of Interior

The mission of supporting depots included receipt, storage and disposal of unserviceable fuels and oxidizers. Disposal included burning or by water injection which is neutralization with water and limestone. Geneva Times. TM 9-1970-2 covers Nike Ajax and provides instructions for destruction and/or disposal of limited quantities of unserviceable, hazardous, or unsalvageable explosive components and liquid propellants at posts, camps and stations. They could also be used as a guide for other installations. Before explosive components are destroyed, they were to be reported through channels to the Chief of Ordnance. TM 9-1970-2 at 69-71. The extend to which these operations would have occurred on the missile battery sites should be investigated on a site-specific basis considering the size of the launch area site and the quantity-distant requirements in outlined in the Ordnance Safety Manual ORD M 7-224.

The methods prescribed for explosive components were burning, demolition, or mechanical methods. Burning or neutralization destroyed liquid propellants. These items were not to be disposed of by burying or dumping in waste places, pits, wells, marshes, shallow streams, or inland waterways. The destruction method was determined by the nature, size and number of units to be destroyed; the facilities available; and the topography of the land designated as the destruction area. TM 9-1970-2 at 69-71.

4.6.1.10 Destruction of Explosive Components

The mission of supporting depots included inspection, removal, replacement, and destruction of propellant and returning of the booster to serviceable condition. Geneva Times. The **destruction of JATOs (M5 rocket motors) was not feasible at batteries** because of the special equipment needed to remove the grain. JATOs to be destroyed were reported in accordance with SR 756-140-1. TM 9-1970-2 at 69-71.

TNT and Composition C were to be used for destruction of explosive components by demolition. Nitrostarch could be substituted for TNT. Destruction of explosive components by fire could be fueled by scrap lumber, wood, or excelsior. TM 9-1970-2 at 69-71.

Explosive components to be destroyed were Safety and Arming Devices, Explosive Harness Assembly and Warhead Initiators, and Warheads. Warheads were to be destroyed by detonation in a pit at least 4 feet deep and covered with earth. If practicable, warheads should be detonated by an explosive harness lead initiated by primacord. TM 9-1970-2 at 69-71.

4.6.1.11 Destruction of Liquid Propellants

Disposal quantities of UDMH and Propellant Mixture M3 were limited to (one bottle) of UDMH or one drum of propellant mixture M3 by burning with the limitation of a minimum separation of 400 or 1,000 feet respectively from inhabited buildings, public highways, public railways, navigable streams, storage areas, and other intensively utilized areas. UDMH could be disposed of by burning in a shallow metal pan. TM 9-1970-2 at 69-71.

In addition to the distant requirements, safety precautions included maintaining separate disposal areas should be maintained for fuels and oxidizers. Burning pans and disposal pits were to be located in areas where prevailing winds will blow toxic fumes away from inhabited areas and where there is no danger of the contamination of water supplies. TM 9-1970-2 at 69-71.

Disposal of appreciable quantities of unserviceable acid was recognized as an engineering and public health problem. Care was to be used in the selection of the disposal sites to prevent the contamination of water sources and the subjecting of inhabited areas to the hazards of fumes. The selected sites for disposal of limited quantities of acid were to be a minimum of 2,400 feet from installation boundaries, inhabited buildings, public railways and highways, and areas where people congregate. The same distance separated selected sites from inland lakes, rivers, or water used for drinking purposes. A trench half filled with crushed limestone or slaked lime approximately 4 feet wide, 30 feet long, and 4 feet deep was to be used for the disposal of the acid. The lime or limestone was to be completely covered with water to allow the acid to be introduced into the trench under the water. TM 9-1970-2 at 69-71.

4.6.2 Nike Hercules

4.6.2.1 Organizational Maintenance

The technical manual for organizational maintenance for the Nike Hercules, TM 9-1410-250-12/1 dated November 1967 with changes through June 1982, covers assembly, testing, corrective maintenance, winterization, and deactivation performed by assembly and service personnel. TM 9-1410-250-12/1 at A, 1-1.

The manual is restrictive and describes the work that can be performed by organizational personnel. Repair parts issued are those parts likely to become worn, broken, or otherwise unserviceable are supplied for operations within the scope of organizational maintenance facilities. TM 9-1410-250-12/1 at 1-1.

4.6.2.2 Cleaning And Preservation Materials

TM 9-1410-250-12/1, TM 9-1410-250-24P/1/1 and TM 9-1410-250-24P-2-1 list cleaning and preservation materials available for the organizational maintenance of the missile rocket motor cluster, body section, and guidance sets. The TMs specified that the cleaning and preservation materials were "to be requisitioned as required for immediate use only". The list of these materials is included in Appendices D.
TM 9-1410-250-12/1 at B1-B5; TM 9-1410-250-24P/1/1 at 1 & 33-37 & 15; TM 9-1410-250-24P-2-1 at 2, 8, & 15.

Guidance set models AN/DPW-17, AN/DPW-17A, and AN/DPW-17B used in Nike Hercules missile numbers 10,206-11,970, included one electron tube, Type OA2WA containing **radioactive materials**. These radioactive materials were shipped, stored, handled and disposed of in accordance with TM 3-261 and TM 38-250. TM 9-1410-250-12/1 includes a radiation hazard warning for radioactive tubes 395A and OA2WA. If the tubes were broken, the surfaces where tubes had been broken were to be cleaned by a wet method described as one pass wiping. A wet cloth was used for a single pass wipe, folded and a clean side used for the next single pass. Back and forth motion was not to be used as it may rub the radioactive material into the surface. The broken tube and all cleaning materials were to be sealed in a container for disposal. **Disposal was to be in accordance with TM 3-261**. TM 9-1410-250-24P-2-1 at iii, 5; TM 9-1410-250-12/1 at C1

4.6.2.3 Assembly Process

The missile was shipped disassembled in the major components to the depots for storage or distribution. The depot may have assembled all the components of the booster rocket motor, except the cluster fin assembly, before shipping to the using organization (missile battery). The depot also installed the Nike Hercules warhead in the warhead body assembly. TM 9-1410-250-12/1 at 3-1.

The using organization inspected for damage and uncrated the components for assembly. As with the Nike Ajax sites, the Nike Hercules batteries included a receiving area adjacent to the assembly and test building, a revetted area and a launching area. The components were routed to the appropriate area as shown in Table 4-6. Upon completion of assembly, testing, and servicing, rocket motor subassembly and the warhead body section are installed in the revetted area. The assembled missile is transported to the launching area. TM 9-1410-250-12/1 at 3-2.

Table 4-6 Missile Battery Component Routing	
Component	**Location**
Rear body and forward body section	Receiving area
Main fins and elevons	Receiving area
Missile rocket motor subassembly and initiators	Revetted area
Warhead body section	Revetted area
Rocket motor cluster fin assembly	Revetted area
Rocket motor cluster assembly	Revetted area
Rocket motor	Revetted area

TM 9-1410-250-12/1 at 3-2

After the sequence of assembly and service operations are shown in Figure 4-6e are complete, final preparation of the missile are performed as follows:

- The missile, assembled on the launching-handling rail, is positioned on the monorail launcher, and the ground power cables are connected.
- The missile rocket motor initiators are installed.
- The propulsion arming lanyard is installed and the missile-away switch adjusted.
- Four rocket motor igniters are installed.
- The two safety-and-arming devices are checked for safe indication and installed.

TM 9-1410-250-12/1 at 3-2.1.

The Nike Hercules missile and rocket motor cluster both contain explosive components. Operations involving the handling of explosives were conducted in specifically designated areas that met the quantity-distance requirements for the type and quantity of explosives involved. The assembly area and launching areas facilities were designed and positioned according to the quantity-distance safety requirements. TM 9-1410-250-12/1 at 3-2.1.

Spilled explosive material was to be removed immediately and the area thoroughly decontaminated before work continued. TM 9-1410-250-12/1 at 3-2.1.

During the assembly operations, all Nike Hercules explosive components were grounded at a common ground stake. Drilling, cutting, sawing, soldering, and similar heat producing operations were prohibited on the missiles with assembled components and associated missile equipment such as launchers, handling equipment and storage racks whenever a missile was affixed to the equipment. TM 9-1410-250-12/1 at 3-2.1.

Uncrating and assembling the missile was similar to the Nike Ajax, however, the Nike Hercules manual specified the use of a cleaning solvent to remove all corrosion-preventive compound from the fin spar sockets and unpainted surfaces of all main fins, elevons, and attaching hardware. The cleaning was followed by a light application of general-purpose lubrication-grade oil. TM 9-1410-250-12/1 at 3-23.

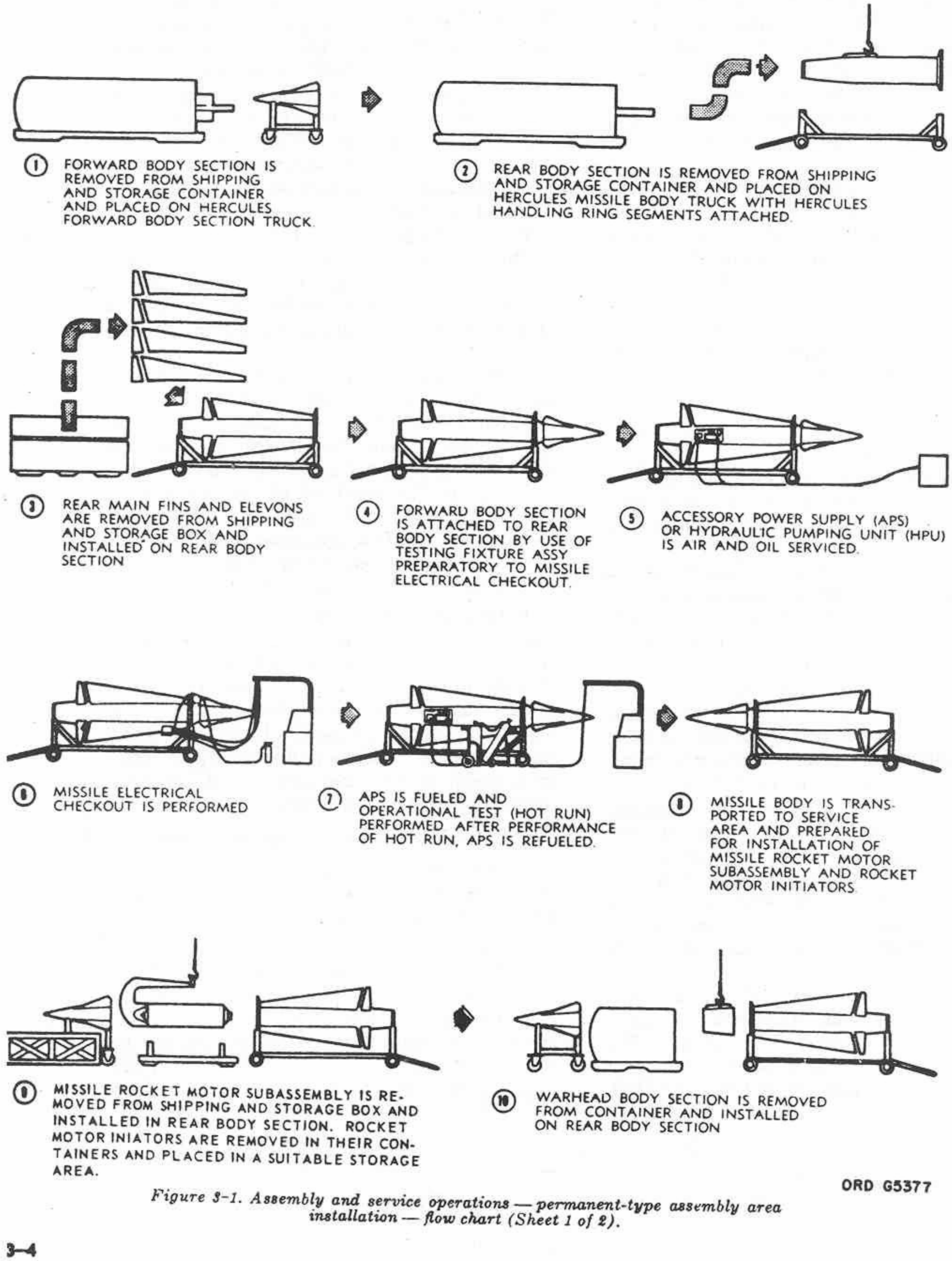

Figure 4-6e: Nike Hercules Assembly Process

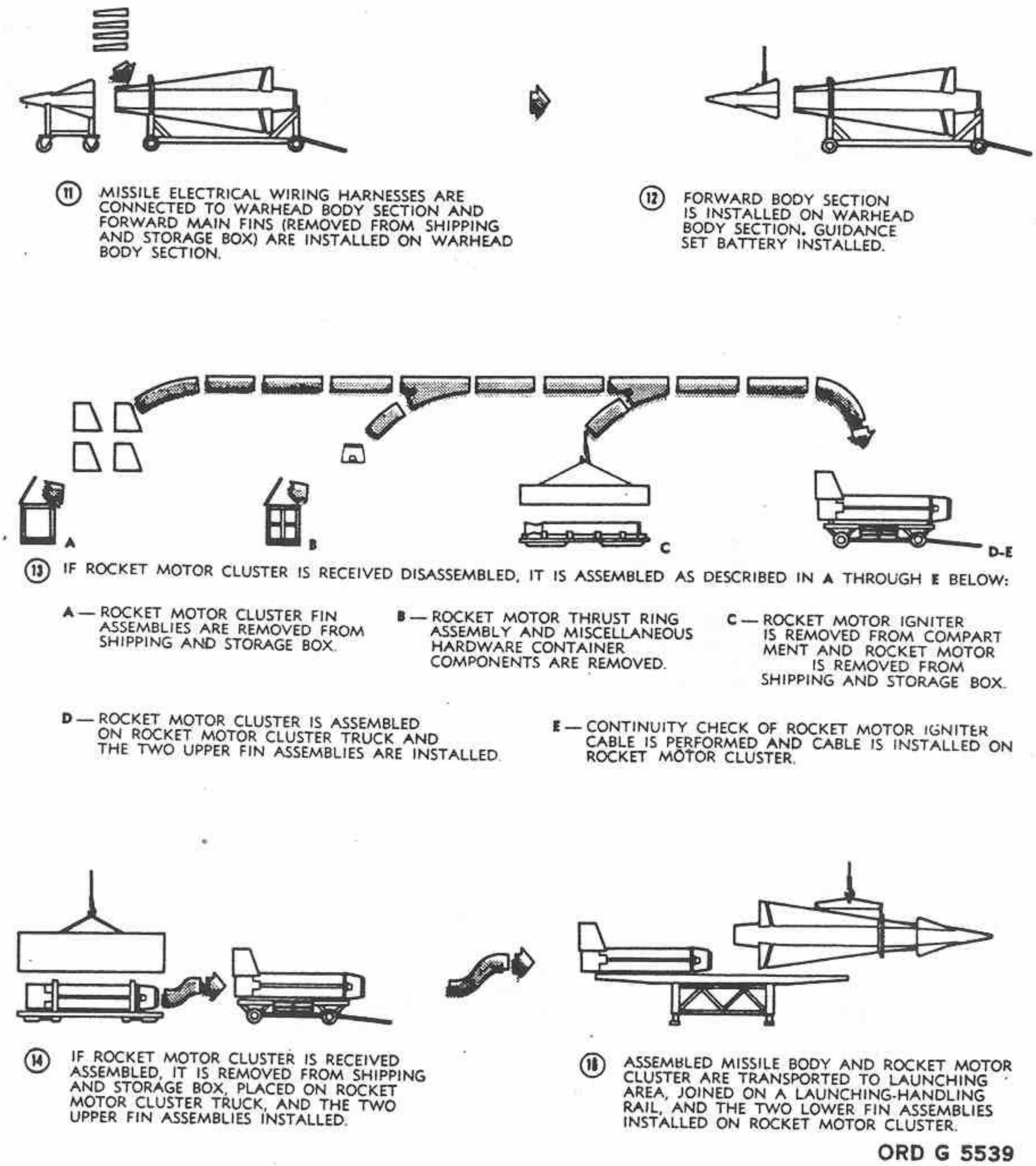

Figure 3–1. Assembly and service operations—permanent-type assembly area installation—flow chart (Sheet 2 of 2).

Figure 4-6e (continued): Nike Hercules Assembly Process

Each Nike Hercules internal accessory power supply (APS) or hydraulic pumping unit (HPU) was serviced with air and oil at the missile assembly site. The **hydraulic oil, MIL-H-5606**, was discharged from the container to the APS through a hose and fitting assembly. Oil drained from the HPU was not reused. The missile electrical checkout was also conducted.[21] TM 9-1410-250-12/1 at 4-1,4-34.

Lubricating oil MS35900-273 was used to service the APS gearbox with a syringe-type means of transferring the oil in the gearbox. This was subject to lubrication after every hour of cumulative run time, whether operated by an external drive motor or with **ethylene oxide (EthO) fuel**. TM 9-1410-250-12/1 at 4-1, 4-8.

Missiles were not to be stored with EthO fuel longer than 12 months. Fueling of the APS was performed outside the assembly building but not necessarily in the revetted area. Fueling equipment consisted of a fuel tank and cart complete with drain valve, drain hose, fuel transfer hose with static ground lead and fuel fill hose with static ground lead. Small quantities of **unserviceable EthO was to be disposed of by burning in applicable instructions or by diluting with a minimum of 22 parts water to each part EthO and dumping into a sanitary sewer or a fast moving stream of water**. TM 9-1410-250-12/1 at, 4-74 & 4-75.

During the assembly process, the missile rocket motor subassembly was uncrated and inspected for damage and to ensure the service life had not been exceeded. The missile rocket motor subassembly contained explosives. Any spilled explosive material was to be immediately removed, and the area thoroughly decontaminated before work continued. The propellant grain and metal parts could be damaged or malfunctions caused could occur due to rough handling, dropping, or extreme temperatures. Inspection for moisture and cracks in the propellant grain structure were conducted. Any moisture was removed with cloth rags. The possible presence of **perchlorate crystals** could cause an explosion during installation of the missile rocket motor subassembly into the blast tube. The potential presence of perchlorate required that the rocket motor adapter[22] be cleaned. **Contaminated rags were disposed of in accordance with existing safety regulations**. TM 9-1410-250-12/1 at, 5-6 to 5-7.

The warhead section installation instructions contained a similar warning as related to explosives. Any spilled explosive material was to be immediately removed, and the area thoroughly decontaminated before work continued. TM 9-1410-250-12/1 at 6-1.

Assembly of the rocket motor assembly required removal of all corrosion-preventive compound from unpainted surfaces of the fin assemblies and the unpainted or interior surfaces of fin assembly components. No material was specified for the removal of corrosion-preventive compound. Similar warnings and instructions regarding safe handling explosives according to

[21] Certain electrical checkout procedures were applicable to certain missiles. For example, during air leakage test of the transponder control group in missile 13001 and subsequent preformed packing, the packing seat, and metal sealing surface were cleaned with a cloth saturated with **toluene** followed by application of a thin coat of **silicone compound, MIL-S-8660**. TM 9-1410-250-12/1 at 4-68.

[22] **Note the rocket motor adapter was a small diameter threaded fitting on the subassembly so perchlorate crystals, if present, would be limited.**

quantity-distance requirements and cleanup of spilled explosives were given for the rocket motor assembly and rocket motor cluster, as for the missile rocket motor subassembly. TM 9-1410-250-12/1 at 8-1, 8-3, 8-5, 8-16. It should be noted that a function of the depots included assembly of the four M5 rocket motors in the M42 cluster. Geneva Times.

The missile body and the rocket motor cluster were transported to the launching area and joined to the launching-handling rail. The missile was installed on the launcher and final connections, adjustments, inspections and installations were accomplished. Warnings and instructions regarding safe handling explosives according to quantity-distance requirements and cleanup of spilled explosives were included in these operations. The missile is now ready to be stored in the underground magazine. TM 9-1410-250-12/1 at 9-1,10-1.

4.6.2.4 Deactivation

Deactivation procedures on the missiles were accomplished in a designated sequence. Throughout the deactivation procedures, the warnings and advisories regarding safe handling explosives requirements and the cleanup of spilled explosives were included. Deactivation of the missile began with removal of the two safety and arming devices, the propulsion arming lanyard, the four rocket motor igniters and the rocket motor initiators. Squib-activated batteries were disconnected in the launching area for missiles numbers 13684 and later. After the missile was disarmed and removed from the launching-handling rail, the missile was transported or the missile body and the rocket motor cluster were separated and transported separately to the service area. There all components were deactivated and prepared for shipment, storage, or removal to repair shops. TM 9-1410-250-12/1 at 11-1,11-5,11-6,11-8.

The main fins and warhead were removed from missile rocket motor subassembly and the components prepared for shipment. TM 9-1410-250-12/1 at 11-1,11-5,11-6,11-8.

Defueling, depressurization of the APS and HPU, and purging of the APS with nitrogen was required during deactivation of the missile. EthO fuel was drained into a 21/2 gallon container half filled with water. Water was used for personnel decontamination or diluting of spilled EthO. If shoes or clothing became contaminated, clothing was dried and shoes were to be disposed of. Small quantities of unserviceable **EthO was to be disposed** of by burning in applicable instructions or by diluting with a minimum of 22 parts water to each part EthO and dumping into a sanitary sewer or a fast moving stream of water. TM 9-1410-250-12/1 at, 11.16 & 11.16.1, 11-18.

Following the defueling, the main fins were removed elevons and the missile body sections were prepared for shipment or storage. **Soft-film corrosion preventive compound** was applied to certain body plugs. TM 9-1410-250-12/1 at, 11-20 & 11.22.

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4.6.2.5 Corrective Maintenance

The scope of corrective maintenance was the replacement of authorized parts in the missile guidance set, forward body section, warhead body section, missile motor section, main fins and elevons, rocket motor cluster, and the shipping and storage containers. Certain deactivation procedures of the missile had to be completed before any corrective maintenance was performed. TM 9-1410-250-12/1 at 12-1 to 12-5.

Damage such as dents, scratches, gouges, and pits to the exterior surface skin required inspection by a battalion direct support (DS) unit to determine whether the missile was serviceable or must be rejected. TM 9-1410-250-12/1 at12-6.

The Nike Hercules corrective maintenance of the missile guidance set included specific instructions related to cleaning and inspection functions similar to the Nike Ajax. Complete or partial disassembly of the guidance set may be required to perform particular maintenance functions. Due to high acceleration applied to the guidance system during trajectory, rigidly controlled procedures were necessary during maintenance. The guidance set must be secure and free of dust or dirt. The technical manual provides detailed handling, cleaning and inspection instructions. TM 9-1410-250-12/1 at12-9.

Specific instructions direct cleaning bare metal parts that will remain disassembled for a long period of time with **trichloroethane** (1,1,1-TCA). Prior to assembling, the parts were to be cleaned with trichloroethane and a permanent lubricant applied as required. TM 9-1410-250-12/1 at12-9, 12-25.

Cleaning of the guidance set or parts included the removal of all signs of corrosion, dust, grit, grease, mold, fungi, or any other foreign substance. Specified methods of cleaning were dependent upon the material to be cleaned.

- Compressed air or dry brushes were used to remove loose dirt and grit.
- Soap and water were used on rubber compounds.
- Electrical wiring insulation was cleaned with a cloth moistened with denatured alcohol.
- Metal surfaces were cleaned with trichloroethane.

TM 9-1410-250-12/1 at 12-9 &12-10.

Preformed packing or gaskets, the packing or gasket seats, and metal sealing surface of access doors, such as the guidance access door and transponder front housing cover, were cleaned with **toluene** followed by application of a thin coat of **silicone compound, MIL-S-8660**. TM 9-1410-250-12/1 at 12-13, 12-19, 12-21, 12-27, 12-29, 12-30, 12-42.

Corrective maintenance of the warhead body section and rocket motor cluster contained the same warnings of explosive safety and cleanup of spilled explosives as in the assembly and deactivation procedures. TM 9-1410-250-12/1 at 12-51.

Corrective maintenance of the APS and HPU and fuel servicing contain the same warnings of hazards of EthO explosive safety, dilution and disposal as in the assembly and deactivation procedures. TM 9-1410-250-12/1 at 12-59.

Preformed packing, plug and thermal battery bracket hole was cleaned with **solvent cleaning compound MIL-C-81302** followed by application of a thin coat of **corrosion preventive compound, MIL-C-16173**. TM 9-1410-250-12/1 at 12-88.3.

Toluene was also used to remove old adhesive from metal surfaces. **Dry cleaning solvent PS-661** was used for removing adhesive from pressure sensitive tape if it did not adhere in the winterization procedures. TM 9-1410-250-12/1 at 12-94.1 & 12-103, 13-23, 13-27.

Disassembly of the Nike Hercules missile or its components beyond the limits authorized for the operator or organizational personnel must never be attempted. TM 9-1410-250-12/1 at 15-1. Removal of the M30 sustainer motor was often performed at missile batteries by depot personnel when it could not be removed in the normal manner. Geneva Times

Moisture sealing procedures for the transponder control group wiring harnesses P1 and J1 required the use of **trichloroethane** supplied in 1-gallon containers. The P1 and J1 connectors were each cleaned with ½ oz. of trichloroethane applied with an acid brush. **The brush and remainder to the ½ oz. trichloroethane were to be discarded**. No additional information was given on disposal method or location. Sealants were removed from connectors and the surface of the transponder control group using a tongue depressor and cloth moisten with trichloroethane. Prior to handling the clean connectors or applying and removing sealants the talc on the rubber gloves were washed off with trichloroethane. TM 9-1410-250-12/1 at D1-D-3, D12-D-13.

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5. DEACTIVATION

Nike Ajax sites not modified for Nike Hercules were deactivated nationwide by 1964. In the fall of 1968, a program targeting the deactivation of Nike Hercules sites was initiated nationwide. By 1971, this program was a part of a major realignment of American defense forces. All West Coast operations were planned for deactivation by June 30, 1975. The official notification of this program declared that, "The action is the latest in a series of economy measures being taken by DOD to cut FY69 expenditures as required by the Revenue and Expenditure Control Act of 1968." Westec, 1987 at 65 cited Argus, September 1968, p. 3.

The disbanding of the Nike system was carried out in an orderly manner with closure of individual units planned to take 180 days. The process involved the packaging and shipping of equipment, disposal of excess equipment, and the transfer of the site to US Army Corps of Engineers following implementation of the closure procedures by the Army operating units. The final closure of the installation generally involved:

1) Notification by the Army that the property was in excess of its needs and requirements.
2) Physically securing of the site to prevent accident or vandalism.
3) Preparation by the Corps of Engineers of a Report of Excess Real Property.
4) Submittal of the Property Report to the General Services Administration.
5) Investigation of the sale, demolition, interim use, or alternate use of the deeds or restrictions placed on the property at the time of acquisition.

Westec, 1987 at 66.

Table 5-1 illustrates the general schedule followed by most fire units during closure. The sequence and timing could be changed to accommodate individual coordination with support agencies. The deactivation schedule requires preparation and shipment of:

- Power generation equipment
- Radar vans and launch control trailers
- Missile components
- Installed property
- Launchers, rails, and side tracks
- Small arms and riot control equipment
- Missile handling and test equipment
- Motor vehicles
- Aircraft

Westec, 1987 Figure 19 at 65.

The deactivation schedule specifically called for retrieval and turn in of diesel fuel and motor gas. Non-mission essential TOE/TA equipment was to be turned in. Non-appropriated fund property was to be disposed of. This materiel was not further identified.

The process for deactivating and preparing this materiel for shipment is contained in the technical manuals. To the extent the TMs identified chemicals used for deactivation and shipment, it is contained in Sections 3 and 4.

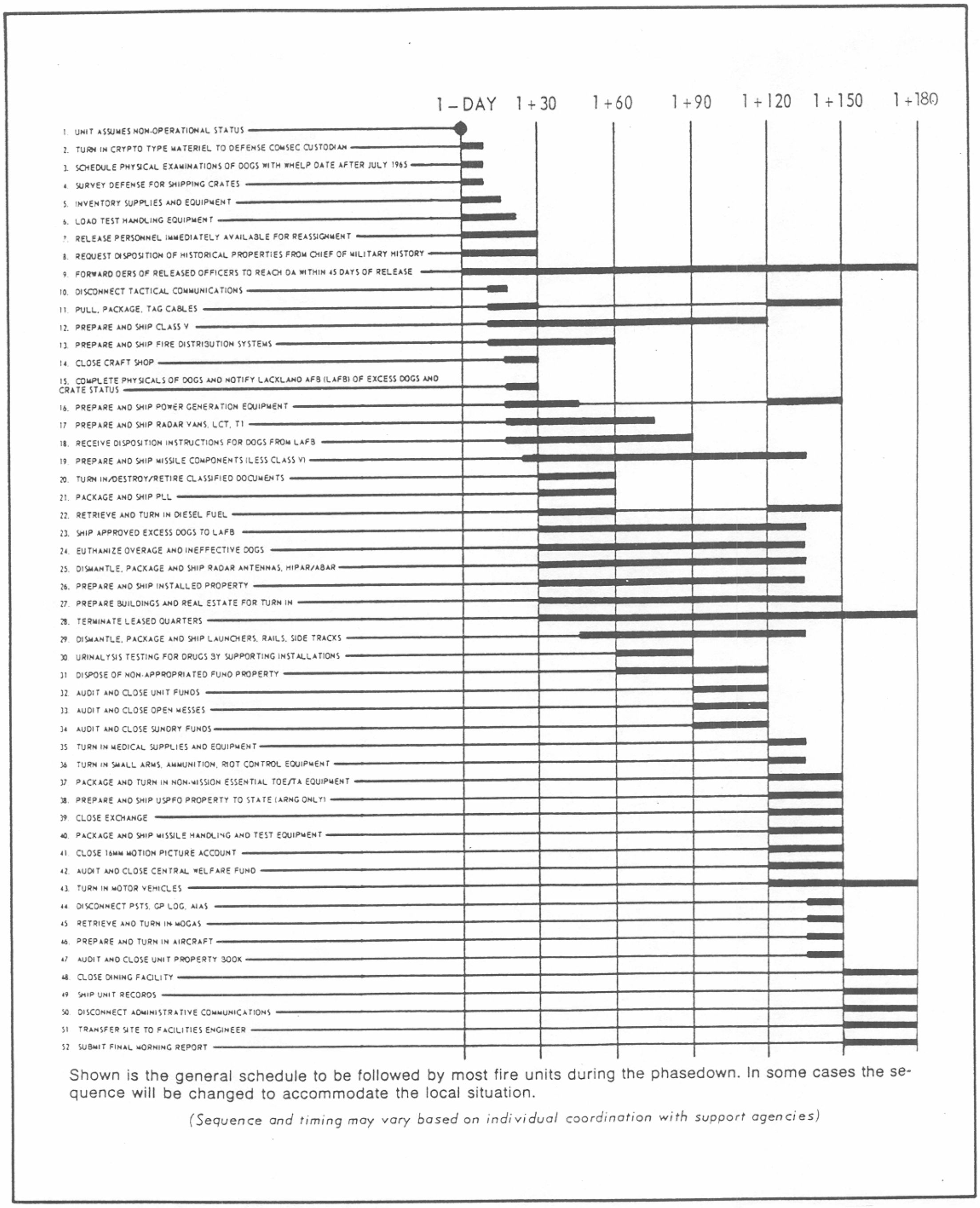

Table 5-1: Deactivation Schedule

APPENDIX A – SOURCE DOCUMENTS

Reference	Document	Source/Library	Y/N Cited
AR 750-530	Dept of Army, AR 750-530, *Maintenance of Supplies and Equipment, Corps of Engineers Equipment at Nike Ajax and Nike Hercules Installations*, 29 October 1958.	Military History Institute (MHI)	Y
Argus, September 1968	Article cited in Westec report, title not given.	Westec	Y
Bender, 1997	Donald E. Bender, *Nike Missile System Overview*, 1997	Internet	N
Berhow	Fort MacArthur Military Museum Association, Berhow, M.A. and Stokes, S.E.,*Nike Missile Sites of the Los Angeles Defense Area*, undated copy.	Plante	Y
BK-6472	US Army, Missile and Munitions Center and School, Redstone Arsenal, AL *Nike Missile System Orientation*, June 1971.	Plante	N
Cole	"W-25: The Davidsonville Site and Maryland Air Defense, 1950-1974", *Maryland Historical Magazine*, Vol. 80, No.3 Fall 1985.	Plante	Y
Cowell	History of Benicia Arsenal, Benicia, California; January 1851- December 1962.	Plante	Y
FM 44-80	January 1956 Field Manual 44-80 "Procedures and Drills for the Nike I System."		Y
FM 44-82	Dept of Army Field Manual, FM 44-82, *Procedures and Drills for Nike Hercules Missile Battery*, Nov 1968.	Marine Corps University	Y
Geneva Times	"Original Mission – Storage of Ammunition at Ordnance Depot", *The Geneva Times*, August 8, 1961, page 12.	Plante	Y
Lonnquest, 1996	"To Defend and Deter: The Legacy of the United States Cold War Missile Program" by John C. Lonnquest, 1996 and David F. Winkler. Also see http://www.cevp.com or http://www.cevp.com/docs/COLDWAR/1996-11-01952.pdf	US Army Corps of Engineers	Y
Loop, 1992	Taken from unidentified US Army Source, 1958 and FM 44-95, ADA Employment Nike Hercules, April 1968.	Plante	Y

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Reference	Document	Source/Library	Y/N Cited
ME 26-03-34, etc	Refers to Standard Drawings (See Appendix C).	Office of History	Y
ME 35-53-03	General Layout - Combined Field Maintenance Shop “as-built” site map (Redmond Washington).	Maas	N
MS-70 “as built” drawing	Several “as built” drawings.	Kinnard	Y
NPS	Two Nat’l Park Service Brochures from SF88-L.	Plante	N
Ordnance Support Plan	Ordnance Support Plan for Guided Missiles and Associated Equipment, General Plan and Annex I, 15 Jul 1955.	File	Y
PAM 750-1-2	Dept of Army Pamphlet, PAM 750-1-2, *Preventive Maintenance Guide for Commanders, Nike Hercules Antiaircraft Guided Missile System*, 1960.	Defense Ammunition Center	Y
Misc	Many articles from Ron Plante and various periodicals, internet items reviewed but not cited.	Various sources/Plante	N
SAE Journal, 1958	R.B. Canright, *Nike Ajax Propellants*, SAE Journal –Vol. 66, No. 40, 1958, page 40.	SAE Journal	N
	Soldiers, *Nikes A-Ok and Running*, March 1987.	Plante	N
TB 9-337	Dept of Army, Technical Bulletin TB 9-337, Guided Missile Systems Corrosion Control and Treatment, March 1961.	MHI	Y
TM 9-500	Dept of Army, Technical Manual, TM 9-500 *Data Sheets for Ordnance Type Materiel*, September 1962.	Plante	Y
TM 9-1385-51	Dept of Army, Technical Manual, TM 9-1385-51, *Identification of Ammunition (Conventional) for Explosive Ordnance Disposal*, February 1967.	Plante	Y
TM 9-1410-206-35	Dept of Army, Technical Manual, TM 9-1410-206-35, *DS, GS and Depot Maintenance Manual, Air Defense Guided Missile Ammunition Items (Nike-Hercules/ Improved Hercules Air Defense Guided Missile System*), April 1963.		N

Reference	Document	Source/Library	Y/N Cited
TM 9-1410-250-12/1	Dept of Army Technical Manual, TM 9-1410-250-12/1, *Operator and Organizational Maintenance Manual: Intercept-Aerial Guided Missile, MIM-14A and MIM-14B (Nike-Hercules/ Improved Hercules Air Defense Guided Missile System*), November 1967.	Defense Ammunition Center	Y
TM 9-1410-250-24P/1/1	Dept of Army Technical Manual, TM 9-1410-250-24P/1/1, *Organizational, DS and GM Maintenance Repair Parts and Special Tools List for Guided Missile, Intercept-Aerial, MIM-14A and MIM-14B Rocket Motor Cluster, Training, M29 Body Section, Guided Missile Training, M84 Shipping and Storage Container Guided Missile Transponder M466 (Nike-Hercules/ Improved Hercules Air Defense Guided Missile System*), December 1970.	MHI	Y
TM 9-1410-250-24P-2-1	Dept of Army Technical Manual, TM 9-1410-250-24P-2-1, *Organizational, DS and GM Maintenance Repair Parts and Special Tools List (including Depot Maintenance Repair Parts and Special Tools) for Simulator, Guided Missile Flight OA-1543C/M, Missile Guidance Set AN/DPW-17, AN/DPW-17A, or AN/DPW-18A (Nike-Hercules/ Improved Hercules Air Defense Guided Missile System*), December 1971.	MHI	Y
TM 9-1430-253-34	Dept of Army Technical Manual, TM 9-1430-253-34, *DS and GS Maintenance Manual: Target-Tracking, Target-Ranging, and Missile-Tracking Antenna-Receiver-Transmitter Group and Radar-Test (Nike-Hercules/ Improved Hercules Air Defense Guided Missile System and Nike-Hercules Anti-Tactical Ballistic Missile System*), January 1960.		N
TM 9-1430-254-12/3	Dept of Army Technical Manual, TM 9-1430-254-12/3, *Operator and Org Maintenance Manual, Assembly and Emplacement Radar Set AN/MPQ-43(Improved Nike Hercules Air Defense Guided Missile System and Nike-Hercules Anti-Tactical Ballistic Missile System*), August 1966.		

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Reference	Document	Source/Library	Y/N Cited
TM 9-1450-250-12	Dept of Army Technical Manual, TM 9-1410-250-12, *Operator and Organizational Maintenance Manual Assembly and Emplacement Servicing and Handling Equipment (Nike-Hercules/ Improved Hercules Air Defense Guided Missile System*), May 1964.	MHI/ IL State	Y
TM 9-1903	Dept of Army Technical Manual, TM 9-1903, *Care, Handling, Preservation, and Destruction of Ammunition*, October 1956.	MHI	Y
TM 9-1970-2	Dept of Army Technical Manual, TM 9-1970-2, *Ammunition Antiaircraft Guided Missile M1 (Nike-Ajax) Identification, Description, Packing, Care, Handling, Preservation, and Destruction*, February 1958.	Plante	Y
TM 9-4935-250-14	Dept of Army Technical Manual, TM 9-4935-250-14, *Technical Manual- Operator, Organizational, DS, and GS Maintenance Manual: Missile and Launcher Test Equipment (Nike-Hercules/ Improved Hercules Air Defense Guided Missile System*), August 1971.		
TM 9-5000-18	Dept of Army Technical Manual, TM 9-5000-18, *Nike I Systems TTR Transmitter and Receiver Circuitry (U)*, May 1956.	Internet	N
TM 9-5000-28	Dept of Army Technical Manual, TM 9-5000-28, *Nike I Systems Guidance Unit (U)*, April 1956.	Internet	N
TM 9-5012-1	Dept of Army Technical Manual, TM 9-5012-1, *Operation and Organizational Maintenance, Antiaircraft Guided Missile M1 (Nike-Ajax Antiaircraft Guided Missile System)* (U), August 1960 w/changes.	NARA	Y
TM 9-5016-2	Dept of Army Technical Manual, TM 9-5016-2, *Organizational Maintenance, Guided Missile Launching Set AN/MSE-2: Launching Control Group OA-868/Mse-2, Control-Indicator C-1448/MSE-2, Simulator Group OA-758/MSE-2, Guided Missile Launcher-Loaders M26A2,M26A3, and Sub-Surface Launcher-*	NARA	Y

Reference	Document	Source/Library	Y/N Cited
	Loader, Guided Missile flight Simulator AN/MPM-28, AN/MPM-28A, and AN/MPM-28B (Nike-Ajax Antiaircraft Guided Missile System), Jun e1960.		
TOE 44-347	Table of Organization and Equipment NR. 44-437E, *Air Defense Artillery Missile Battery, Nike-Ajax*, 25 June 1959.	MHI	Y
TOE 44-448	Table of Organization and Equipment NR. 44-448D, *Air Defense Artillery Missile Double Battery, Nike-Ajax, CONUS*, 13 November 1957.	MHI	Y
TOE 44-547	Table of Organization and Equipment NR. 44-547E, *Air Defense Artillery Missile Battery, Nike-Hercules, CONUS*, 12 November 1964.	MHI	Y
Website	http://ed-thelen.org/ contains numerous articles and pictures.	Internet	Y
Website	www.homestead.com/nenike1/files/niketech.htm	Internet	Y
Westec, 1987	WESTEC Services, Inc., *Historical Cultural Resources Survey and Evaluation of the Nike Missile Sites in the Angeles National Forest, Los Angeles County, California*, February 1987.		Y
Whitacre, 1996	Christine Whitacre, Editor, *Last Line of Defense*, Nike Missile Sites in Illinois, National Park Service, 1996. Also see http://www.cevp.com or http://www.cevp.com/docs/COLDWAR/1996-01-02135.pdf	Chicago District	Y

APPENDIX B – GLOSSARY OF TERMS AND ACRONYMS

1,1,1-TCA .... trichlorethane

AAA .... Anti-Aircraft Artillery

AADCP .... Army Air Defense Command Post

ABAR .... Alternate Battery Acquisition Radar
included: AN/FPS-75, AN/FPS-71 and AN/FPA-16 (which integrates FPS-71 with LOPAR), or AN/FPS-69 issued in place of HIPAR

ACQR .... Acquisition Radar, later named LOPAR

ADA .... Air Defense Artillery

AN .... Army/Navy major piece of equipment

AN/FPA-16 .... See ABAR

AN/FPA-69 .... See ABAR

AN/FPS-71 .... See ABAR

AN/FPS-75 .... See ABAR

AN/FSG-1 .... See Missile Master

AN/TSG-51 .... See Missile Mentor

APS .... Accessory Power Supply for Nike Hercules

ARAACOM .... Army Anti-aircraft Command
1950-1957 Predecessor to ARADCOM

ARADCOM .... United States Army Air Defense Command
From 1957 to 1974 the Army component of continental air defense, consisting primarily of Nike battalions.

ASP .... Annual Service Practice

Augmentation .... Additional assets of personnel or equipment

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added to an Army unit's organization.

Battalion.. An Army unit of approximately 500-700 soldiers commanded by a lieutenant colonel and containing its own staff and limited support functions. Subordinate Nike units of a Battalion are called batteries. A typical Nike battalion had four firing batteries and a headquarters battery (HHB). Battalions had distinctive designations.

Battery................... In the artillery, the basic fire unit, commanded by a captain and consisting of various sections and platoons. In a Nike battery there was three sections: the fire control platoon, launcher platoon, and the company headquarters (with clerks and cooks). Batteries were either HHBs or lettered (firing batteries) A to D).

BDE... Brigade

BIRDIE .... Battery Integrated Radar and Display Equipment. (AN/GSG-5 or AN/GSG-6)

Bn .... Battalion

Brigade..................A unit above the group commanded either by a brigadier general or a colonel. The brigade oversaw a large geographical area and the normal subordinate unit was the group, although battalions could be directly subordinate to a brigade. Brigades had additional fire control and radar assets. Brigades were subordinate to the air defense regions which were the major subdivisions of ARAACOM/ ARADCOM. Brigade oversaw a large geographical area and the normal subordinate unit was the group.

CONAD .... Continental Air Defense Command consisting primarily of Nike battalions

Corps .... U.S. Army Corps of Engineers

DoD.. Department of Defense

EthO .... ethylene oxide

FM .... Field Manual

FUIF... Fire Unit Integration Facility provided the interface at the battery for data from higher HQs

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Group .... An artillery unit above a battalion, commanded by a colonel. The group usually had responsibility for several battalions over a specific geographical region and was usually, though not always, subordinate to a brigade. Groups had additional support and fire control assets.

HE .... High Explosive (warheads)

HHB .... Headquarters and Headquarters Battery
Each headquarters above the battery- level had a separate headquarters battery that contained the unit's staff sections, maintenance, radar, medical and additional assets at the commander's disposal.

HIPAR.. High-Power Acquisition Radar

HPU...Hydraulic Pumping Unit

Hz... Hertz

IBDL ....Interim Battery Data Link

IFC .... Integrated Fire Control
The section of a Nike firing battery responsible for guiding the missile onto its target typically lettered (firing batteries) A to D) located 1000-6000 yards from the launch site.

IRFNA..Inhibited Red Fuming Nitric Acid

LA .... Launch Area

LCS ....Launching Control Station

LOPAR .... Low Power Acquisition Radar

MP.. Military Police

MTR... Missile Tracking Radar

Missile Master..(AN/FSG-1) Area fire control radar for Nike, usually run at the group or brigade level. Operational in 1959 and replaced by the Missile Mentor in the mid-60s.

Missile Mentor.. (AN/TSQ-51) Fire Distribution System
A solid-state radar system that was deployed starting in 1966 and only took up space in two trailers.

NORAD ....North American Air Defense Command
The combined (with the Royal Canadian Air Force) command responsible for North American theater air defense.

PA .... Preliminary Assessment

PM Indicator ....Preventive Maintenance Indicator

RRIS...Remote Radar Integration Station gap filler to AN/TPQ-51

S&A ....Safety & Arming

SAC.. Strategic Air Command

TB ....Technical Bulletin

Technician.. A full-time civilian employee of the Army National Guard who was also a part-time member of the National Guard.

TM.. Technical Manual

TOE...Table of Organization and Equipment
The authorizing document which established the organizational structure and equipment allowances for a unit in the Army.

TRR..Target Ranging Radar

TTR...Target Tracking Radar

Primary sources of terms from Nike Glossary at (www.homestead.com/nenike/files/ngloss.htm) and Fort MacArthur Military Museum Association.

UDMH .... unsymmetrical dimethylhydrazine

APPENDIX C – MILITARY MANUAL CODE NUMBER SYSTEMS

The numbering of the field manuals and technical manuals referred to in this report follow the standard number system that was started at the beginning of the Second World War. An understanding of this numbering system is necessary as the number is relevant to what echelon conducts the work described.

Field Manuals (FMs) were usually numbered by a one to two digit number followed by a dash followed by a one to two digit number, like "FM 44-82", with the first series on numbers being the subject classification of the manual and the second series being the particular manual. Early Technical Manuals (TMs) were originally numbered similar to the FMs such as the 1956 "TM 9-5012-1" for the Nike Ajax. The first number being the subject or branch of the Army - number "9" means that it is an Ordnance Branch manual and the second series of numbers (5012) referring to the particular manual. The number of each pamphlet will consist of two parts: the basic number and subnumber.

Because there were considerably more TMs by the early 1960's, they began to be changed to a more complex numbering system. The many later TM's, concerned with single pieces of equipment, especially Ordnance equipment, were numbered like "TM 9-1450-250-12".

- The first number refers to the branch. The number "9" means that it is an Ordnance branch document. (See table C-1 for a list of the basic branches).
- The second series of numbers (1450) refer to the subject type – Nike Hercules/ Improved Hercules Air Defense Guided Missile System.
- The third series refers to the particular piece of equipment or subject -Servicing and Handling Equipment.
- The four series on numbers (12) refer to the level of maintenance that the manual is concerned - operator and organizational maintenance level. The first number indicates the lowest level covered, and the second number indicates the highest, with 0 indicating the same level as the original number.

Other numbers in the fourth series are as follows:

10 = Operator Maintenance
20 = Organizational Maintenance (local unit motor pool)
30 = Direct Support Maintenance (your local maintenance battalion)
40 = General Support Maintenance
50 = Depot Maintenance

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The numbers can stand on their own or in combination. For example:

12 = Operator AND Organizational Maintenance
24 = Organizational AND DS AND GS Maintenance

A "P" on the end indicates a parts manual for the levels of maintenance shown by the numbers in front.

20P = Parts Manual for Organizational Maintenance Repairs

A “+P”, which means it's a repair manual and a parts manual.

24+P = Repair manual for Organizational, DS, GS mechanics AND a parts manual for the same levels of repair.

Technical Bulletins that are on the same basic subject are listed with the Technical Manuals after the relevant Technical Manual.

Table C-1	
1. Army Air Forces.	20. Miscellaneous.
2. Cavalry.	21. Individual Soldier.
3. Chemical Warfare Service.	22. Individual Drill Regulations.
4. Coast Artillery Corps.	23. Basic weapons, including accessories and ammunition.
5. Corps of Engineers.	24. Communication.
6. Field Artillery.	25. Transportation.
7. Infantry.	26. Interior guard duty.
8. Medical Department.	27. Military law.
9. Ordnance Department	28. Band.
10. Quartermaster Corps.	29. Military Police.
11. Signal Corps.	30. Military Intelligence.
12. Adjutant General's Department.	31. Special Operations.
13. Inspector General's Department.	35. Women's Army Corps.
14. Finance Department.	36. Supply procedures.
15. Judge Advocate General's Department.	44. Coast Artillery Corps (antiaircraft artillery and barrage balloon T/O's, T/E's, T/BA's and T/A's only).
16. Corps of Chaplains.	55. Transportation Corps.
17. Armored Force.	100. Field Service Regulations.
18. Tank Destroyer.	101. Staff Officers' Field Manual.
19. Military Police.	105. Umpire Manual.
101. Staff Officers' Field Manual.	
105. Umpire Manual.	

http://www.milman.simonides.org/manuals-frame.htm
http://www.military-info.com/freebies/D5.htm

APPENDIX D – TECHNICAL BULLETINS AND MANUALS

Missiles and Missile Components

TB 9-337, Guided Missile Systems Corrosion Control and Treatment........... Table III, Paints and Related Materials

TM 9-500, Data Sheets for Ordnance Type Material ....19-20 to 19-22, 19-76 to 19-78

TM 9-1410-250-12/1, Operator and Org Maintenance Manual: Intercept-Aerial Guided Missile MIM-14A and MIM-14B.................................... Appendix B, Cleaning and Preserving Materials

TM 9-1410-250-24P/1/1, Organizational, DS and GS Maintenance Repair Parts and Special Tools List for Guided Missile, Intercept-Aerial MIM-14A and MIM-14B Rocket Motor Cluster, Training, Body Section, Shipping and Storage Container, Guided Missile Transponder................ .... Section II Cleaning and Preserving Materials

TM 9-1410-250-24P-2-1, Organizational, DS and GS Maintenance Repair Parts and Special Tools List for Simulator, Guided Missile Flight OA-1543C/M, Missile Guidance Set................... .... Section II Cleaning and Preserving Materials

MHI
Copy 1

TB 9-337

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

GUIDED MISSILE SYSTEMS
CORROSION CONTROL AND TREATMENT

ARCHIVES

HEADQUARTERS, DEPARTMENT OF THE ARMY

MARCH 1961

AGO 5024A

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Table III. Paints and Related Materials

Item No.	Item	Federal stock No.	Specification	Unit of issue	Responsible technical service	Purpose
1	Acetone, technical	6810-281-1863	O-A-51	1 lb.	Cml	Cleaning metal instruments.
2	Adhesive, synthetic rubber	8040-582-4830	EC-711	1 pt.	----------	Installing rubber gaskets.
3	Alcohol, Butyl	6810-241-4709	MIL-B-11322	1 gal.	Cml	Preparing alcohol-phosphoric-acid solution.
4	Alcohol, denatured	6810-191-1627	O-A-396	1 gal.	Eng	Cleaning wire insulation.
5	Alcohol, Isopropyl	6810-286-5435	MIL-A-10428	1 gal.	Cml	Preparing alcohol-phosphoric-acid solution.
6	Aluminum wool	5350-286-4851	MIL-A-4864	1 lb.	Ord	Cleaning aluminum surfaces.
7	Brush, cleaning, aircraft.*	7920-281-7009	MIL-B-5612	Ea	Qm	Applying paint remover.
8	Brush, dusting, bench	7920-178-8315	H-B-201	Ea	Qm	Cleaning equipment.
9	Brush, paint, flat, 3-in.	8020-242-7266	H-B-0420	Ea	Eng	Painting large areas.
10	Cheesecloth	8305-170-5063	CCC-C-440	Yd.	Qm	Tack rags and general cleaning.
11	Chromic acid	6810-264-6517	O-C-303	5 lb.	Cml	Removing light corrosion from magnesium.
12	Cleaner, anti-static	6850-368-5227	MIL-C-12156	1 pt.	Ord	Cleaning plastic surfaces.
13	Cloth, abrasive, aluminum oxide, grit No. 240, grade 7/0.	5930-161-9715	P-C-451 type I	50 sheets	Ord	Mechanical removal of corrosion.
14	Cloth, abrasive, aluminum oxide, grit No. 320, grade 9/0.	5350-246-0330	P-C-451 type I	50 sheets	Ord	Mechanical removal of corrosion.
15	Cloth, abrasive, silicon carbide, grit No. 240, grade 7/0.	5350-271-5958	P-C-451 type II	50 sheets	Ord	Sanding painted surfaces.
16	Cloth, abrasive, silicon carbide, grit No. 320, grade 9/0.	5350-271-5957	P-C-451 type II	50 sheets	Ord	Sanding painted surfaces.
17	Coating compound, metal pretreatment, resin-acid.	8030-165-8577	MIL-C-15328	5 gal.	Eng	Pretreatment coating for use before paint finish.
18	Corrosion preventive compound	8030-231-2345	MIL-C-16173 grade 1.	1 gal.	Ord	Protecting unpainted metal surfaces.
19	Corrosion removing compound	6850-174-7670	MIL-M-10578 type 1.	5 gal.	Ord	Chemical removal of corrosion products.
20	Corrosion resistant primer	8030-613-3131	MIL-C-5541	4 oz. bottle	----------	Paint base and corrosion resistant film for aluminum.
21	Detergent, painted surface	7930-249-8036	P-C-431	5 lbs.	QM	Cleaning painted surfaces.
22	Enamel, blue	8010-559-3144	MIL-E-74	½ pt.	Eng	Plug and receptacle identification.
23	Enamel, gray	8010-559-3143	MIL-E-74	½ pt.	Eng	Plug and receptacle identification.
24	Enamel, gray	8010-680-2070	TT-E-487	1 qt.	Eng	Painting interior of equipment cabinets.
25	Enamel, green	8010-559-3138	MIL-E-74	½ pt.	Eng	Plug and receptacle identification.
26	Enamel, green (OD)	8010-297-0586	TT-E-527	1 gal.	Eng	OD touch-up and acquisition antenna radome.
27	Enamel, green (OD)	8010-297-2124	TT-E-485	1 gal.	Eng	Exterior OD surfaces. Not to be used on radome.
28	Enamel, light yellow	8010-559-3237	MIL-E-74	½ pt.	Eng	Plug and receptacle identification.
29	Enamel, orange	8010-559-3240	MIL-E-74	½ pt.	Eng	Plug and receptacle identification.
30	Enamel, red	8010-559-3239	MIL-E-74	½ pt.	Eng	Plug and receptacle identification.
31	Enamel, yellow	8010-559-3238	MIL-E-74	½ pt.	Eng	Plug and receptacle identification.
32	Grease	9150-261-8298	MIL-G-3278	1 lb.	QM	General lubrication.

*This brush is supplied without a handle. Be sure to provide a long handle before working with acid solutions.

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Table III. Paints and Related Materials—Continued

Item No.	Item	Federal stock No.	Specification	Unit of issue	Responsible technical service	Purpose
33	Lacquer, aluminum	8010-598-5204	MIL-L-7178	1 pt.		Treating aluminum clad steel.
34	Lacquer, gray	8010-324-5781	MIL-L-7178	½ pt.	Eng	Painting inside surfaces of trailers with the exception of the electronic shop.
35	Litmus paper, strip form	6640-291-8722		100 strips		Testing for acidity of prepared surfaces.
36	Nitric acid (SP Gr 1.42) HNO_3	6810-130-1912		1 lb. bottle	Ord	Make-up of chrome-pickle solutions.
37	Oil, lubricating, preservative	9150-231-2361	MIL-G-3150	1 qt.	QM	Medium-weight oil for general lubrication.
38	Paint, design kit	7520-324-5782	MIL-L-7178 color 2650.	1 pt.	Ord	For interior surfaces of the electronic shop and its bins.
39	Paint, white, heat reflective	8010-324-5786	TT-E-529, Class A.	½ pt.	Ord	For exterior touch-up of trailers and tracking antennas.
40	Paper, abrasive, flint gr 4/0	5350-597-4561	P-P-105	100 sheet sleeve.	Ord	Sanding.
41	Paper, abrasive, flint gr 5/0	5350-598-5972	P-P-105	100 sheet sleeve.	Ord	Sanding.
42	Pasajel	Commercially available.		1 qt.		Obtain from Semco Sales and Service Co., 3141 W. Century Blvd., Inglewood, Calif. For use on corrosion resisting steel.
43	Phosphoric acid	6810-551-9578	OME-PD109	5 gal.	Ord	For preparing alcohol-phosphoric-acid solution.
44	Primer coating vinyl-zinc chromate	8010-597-7854	MIL-P-11414	1 gal.	Eng	For priming metal surfaces.
46	Primer, zinc yellow	8010-161-7339	TT-P-666	1 gal.	Eng	For priming magnesium and aluminum surfaces when top coat is lacquer.
47	Rags, wiping, cotton	7920-579-9277	CCC-R-30	50 lb. bale.	QM	General cleaning.
48	Remover, paint, organic solvent type	8010-165-5536	MIL-R-25134	5 gal.		For removing paint and lacquer.
49	Sealing compound	8030-275-8110	MIL-S-11031	1½ pt.	Ord	Installing gaskets and general sealing.
50	Sealing compound	8030-656-1042	EC-801	1 gal.		Coating threaded parts.
51	Soap, automobile and floor	7930-170-5466	P-S-560	1 gal. can	QM	General cleaning.
52	Sodium dichromate	6810-143-2000	O-S-595	1 lb. bottle.	Cml	Make-up of chrome-pickle treatment for magnesium.
53	Solvent, dry cleaning	6850-281-1985 6850-264-9038	P-S-661, type I	1 gal. 5 gal.	QM	General cleaning.
54	Thinner, dope and lacquer	8010-160-5787	TT-T-266	1 gal.	Eng	For thinning lacquer.
55	Thinner, synthetic resin enamel	8010-160-5794	TT-T-306	1 gal.		For thinning synthetic enamels.
56	Thinner, paint, mineral spirits	8010-242-2089	TT-T-291	1 gal.	QM	General cleaning and paint thinning.
57	Toluene	6810-322-7847	JAN-T-171, GR B	1 gal.	Ord	Paint solvent.
58	Trichloroethane	6810-664-0387	O-T-620	1 gal.	Cml	Cleaning parts and metal surfaces.

AGO 6024A

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TM 9-500

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

DATA SHEETS FOR ORDNANCE TYPE MATERIEL

This copy is a reprint which includes current pages from Changes 1 through 4. Pen and ink changes to be made are listed in the front of the manual. Read the instructions concerning these pages before using the manual.

HEADQUARTERS, DEPARTMENT OF THE ARMY
SEPTEMBER 1962

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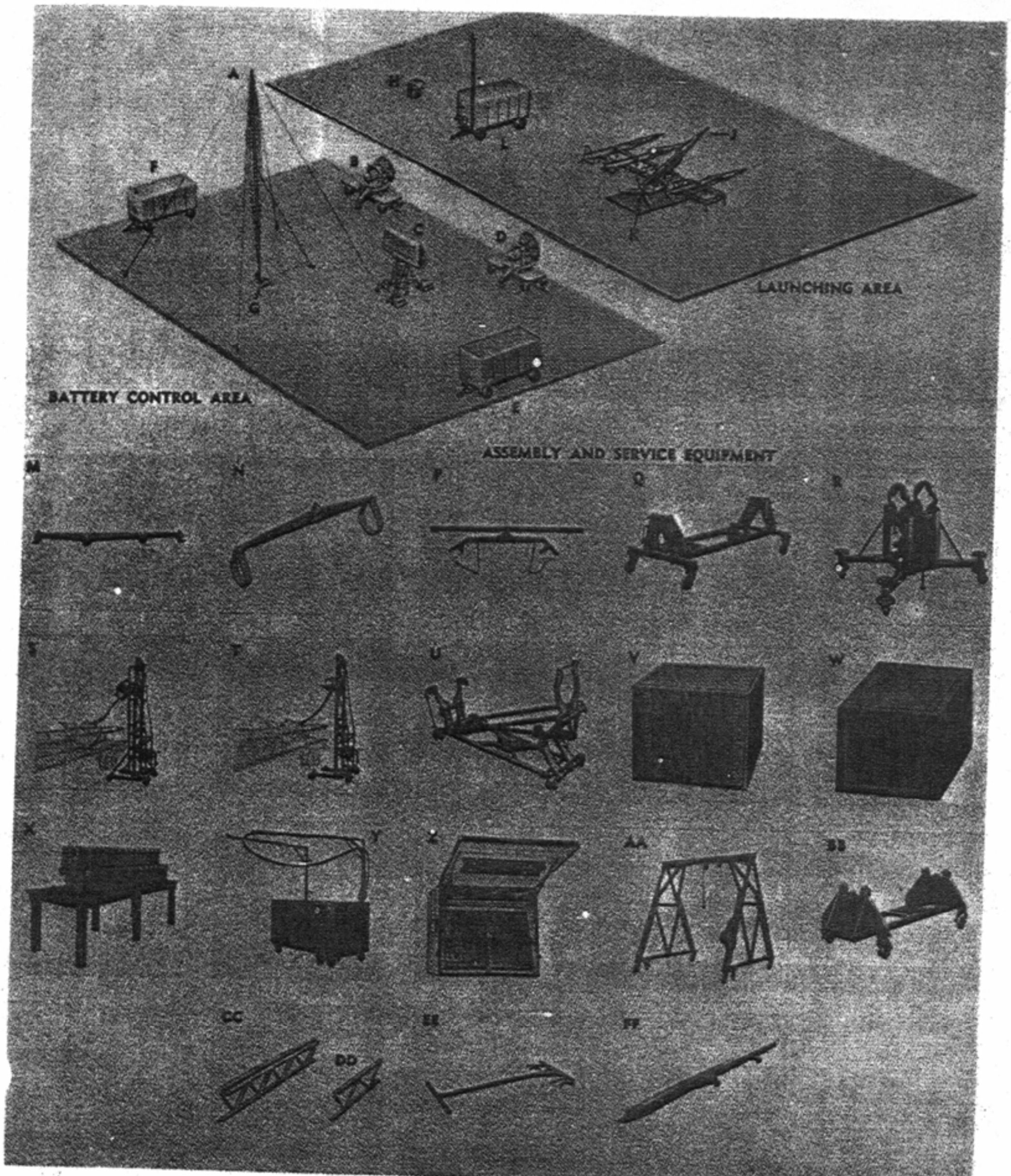
AIR DEFENSE GUIDED MISSILE SYSTEM NIKE-AJAX

(Includes specially designed components of guided missile remote control systems; nonairborne guided missile launchers; specially designed trucks for use in transporting guided missiles; specially designed hoisting beams; checkout equipment and test equipment specially designed for use with guided missiles and guided missile remote control systems.)



19–20 **Source: TM 9-500, September, 1962**

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BATTERY CONTROL AREA

A—ANTENNA-MAST GROUP: OA-739/MSW-1
B—ANTENNA-RECEIVER-TRANSMITTER GROUP, MISSILE TRACKING, TRAILER MOUNTED: OA-654/MPA-4 through OA-654G/MPA-4
C—ANTENNA-RECEIVER-TRANSMITTER GROUP, ACQUISITION: OA-653/MS
D—ANTENNA-RECEIVER-TRANSMITTER GROUP, TARGET TRACKING, TRAILER MOUNTED: OA-655/MPA-4 through OA-655G/MPA-4
E—DIRECTOR STATION, GUIDED MISSILE, TRAILER MOUNTED: AN/MSA-7, AN/MSA-7A, AN/MSA-17, AN/MSA-17A
F—TRACKING STATION, GUIDED MISSILE, TRAILER MOUNTED: AN/MPA-4 and AN/MPA-4A
G—TEST SET, RADAR: TS-847/MSW-1 and TS-847A/MSW-1

LAUNCHING AREA

H—CONTROL INDICATOR: C-1488/MSE-2
J—GUIDED MISSILE, AIR DEFENSE: M1
K—LAUNCHER, GUIDED MISSILE: M22, M22A1, M22A2, and M22A3
L—SIMULATOR STATION, RADAR SIGNAL, GUIDED MISSILE SYSTEM, TRAILER MOUNTED: AN/MPQ-36 (15D2)

ASSEMBLY AND SERVICE EQUIPMENT

M—BEAM, HOISTING, GUIDED MISSILE
N—BEAM, ASSEMBLY, BOOSTER
P—BEAM, ASSEMBLY, WARHEAD
Q—TRUCK, GUIDED MISSILE ROCKET MOTOR: M254
R—TRUCK, GUIDED MISSILE BODY SECTION: M255
S—SERVICER, ACID, GUIDED MISSILE: M2
T—SERVICER, FUEL, GUIDED MISSILE: M3 and M3A1
U—CARRIAGE, MISSILE HANDLING: M25
V—DRAINING KIT, FUEL, GUIDED MISSILE: M54
W—DRAINING KIT, OXIDIZER, GUIDED MISSILE: M53
X—RACK, BATTERY: MT-1498/G
Y—STAND, TEST, HYDRAULIC SYSTEM, MISSILE: M14
Z—TEST SET, GUIDED MISSILE: AN/DSM-12, AN/DSM-12A, and AN/DSM-12B
AA—TRUCK, INERT GUIDED MISSILE: M257
BB—TRUCK, INERT GUIDED MISSILE: M256
CC—SIDE TRUSS, LOADING RACK, GUIDED MISSILE:
DD—END TRUSS, LOADING RACK, GUIDED MISSILE:
EE—DRAWBAR, TRUCK, BRACKET, HAND:
FF—RAIL, LAUNCHING AND HANDLING: M1, M1A1, and M1A2

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The equipment required to complete the system, which includes maintenance, repair, and check-out equipment especially designed for use with guided missiles and guided missile control systems, will be added at a later date.

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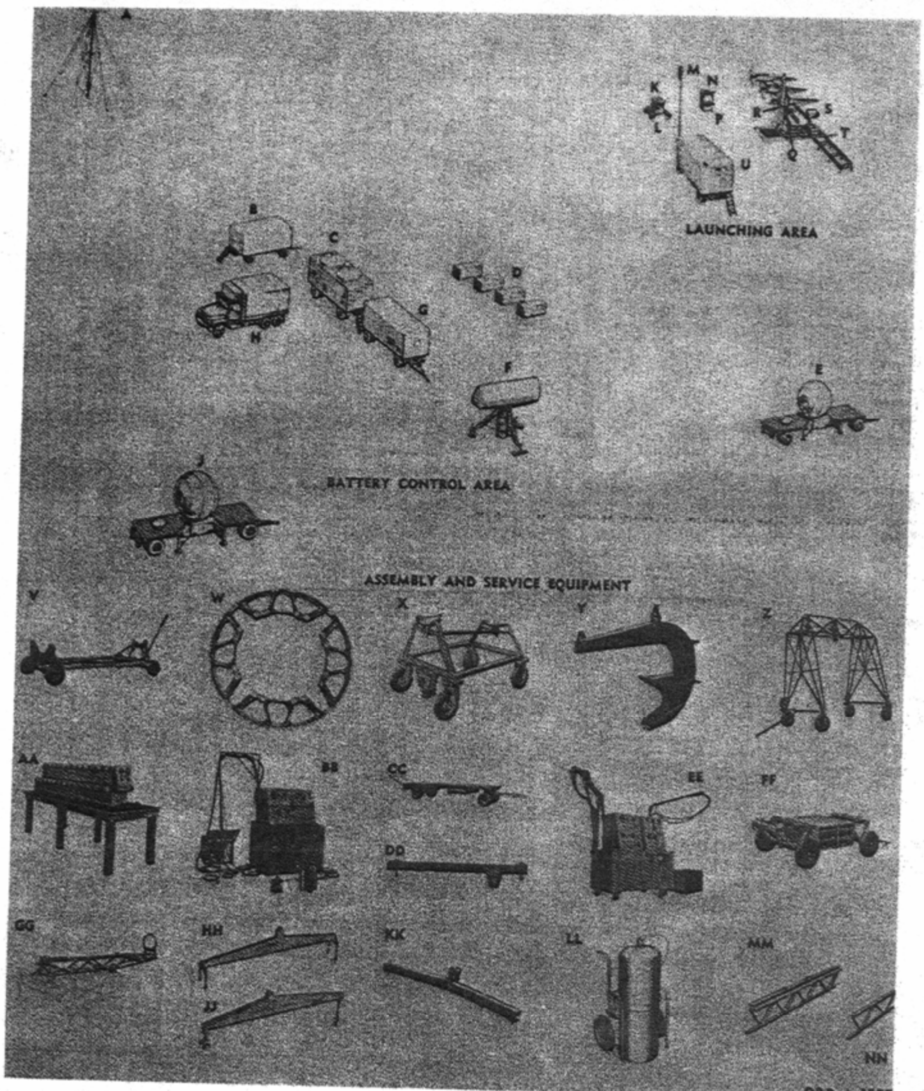
TM 9–500

AIR DEFENSE MISSILE SYSTEM—NIKE-HERCULES

(Includes specially designed components of guided missile remote control systems; non-airborne guided missile launchers; specially designed trucks for use in transporting guided missiles; specially designed hoisting beams; a special purpose trailer; checkout equipment and test equipment specially designed for use with guided missiles and guided missile remote control systems; and an engine generator set.)



19–76 **Source: TM 9-500, September, 1962**

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BATTERY CONTROL AREA
A—ANTENNA-MAST GROUP, COLLIMATION: OA-1600/T
B—ELECTRONIC SHOP, TRAILER MOUNTED:
C—TRACKING STATION, GUIDED MISSILE, TRAILER MOUNTED: AN/MPA-5
D—GENERATOR SET, DIESEL ENGINE:
E—ANTENNA-RECEIVER-TRANSMITTER GROUP, MISSILE TRACKING, TRAILER MOUNTED: OA-1340/MPA
F—ANTENNA-RECEIVER-TRANSMITTER GROUP, ACQUISITION:
G—DIRECTOR STATION, GUIDED MISSILE, TRAILER MOUNTED: AN/MSA-19
H—FIRE UNIT INTEGRATED FACILITY (FUIF) TRUCK
J—ANTENNA-RECEIVER-TRANSMITTER GROUP, TARGET TRACKING, TRAILER MOUNTED: OA-1487/MSA

LAUNCHING AREA
K—TEST SET, GUIDED MISSILE: AN/DSM-33
L—TRUCK, GUIDED MISSILE TEST SET: M451
M—SIMULATOR, GUIDED MISSILE, FLIGHT: OA-1643/M
N—CONTROL INDICATOR: C-2620/TSW
P—SIMULATOR GROUP: OA-2060/MSW-4
Q—LAUNCHER, MONORAIL, GUIDED MISSILE: M36
R—GUIDED MISSILE, AIR DEFENSE: XM6
S—CONTROL INDICATOR: C-2699/TSW
T—RAIL, LAUNCHING-HANDLING, GUIDED MISSILE: M5
U—LAUNCHING CONTROL GROUP, GUIDED MISSILE, TRAILER MOUNTED: AN/MSW-4

ASSEMBLY AND SERVICE EQUIPMENT
V—TRUCK, GUIDED MISSILE BODY SECTION: XM473
W—RING, HANDLING, GUIDED MISSILE:
X—TRUCK, GUIDED MISSILE, NOSE SECTION: M489
Y—BEAM, HOISTING, GUIDED MISSILE, SOLID MOTOR: XM11
Z—HOISTING UNIT, PORTABLE, GUIDED MISSILE, MISSILE AND JATO UNIT JOINING: XM26E1
AA—RACK, BATTERY: MT-1498/G
BB—TEST SET, GUIDED MISSILE: (ORD NO. 9025326)
CC—TRAILER, FLATBED, GUIDED MISSILE: M261A1
DD—BEAM, HOISTING, GUIDED MISSILE: XM12
EE—TEST STAND, HYDRAULIC SYSTEM COMPONENTS:
FF—TRUCK, GUIDED MISSILE, ROCKET MOTOR: M442, W/E
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HH—BEAM, HOISTING, GUIDED MISSILE: BOOSTER CLUSTER, M13
JJ—BEAM, HOISTING, GUIDED MISSILE: COMPLETE MISSILE, XM14
KK—BEAM, HOISTING, GUIDED MISSILE, WARHEAD SECTION: M7E1
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NN—RACK, LOADING, GUIDED MISSILE, SUPPORT ASSEMBLY LOADING RACK: M10

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The equipment required to complete the SYSTEM, which includes maintenance, repair and checkout equipment especially designed for use with guided missiles and guided missile control systems, will be added at a later date.

TM 9-1410-250-12/1

TM 9-1410-250-12/1

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

BAUER

OPERATOR AND ORG MAINTENANCE MANUAL:

INTERCEPT-AERIAL GUIDED MISSILE MIM-14A AND MIM-14B

(NIKE-HERCULES AND IMPROVED NIKE-HERCULES AIR DEFENSE GUIDED MISSILE SYSTEMS)

This copy is a reprint which includes current pages from Changes 1 through 3. Pages applying to all systems are inserted in proper numerical order in the manual. Pages which have different effectivities are inserted in the front of the manual. Read the instructions concerning these pages before using the manual.

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HEADQUARTERS, DEPARTMENT OF THE ARMY

NOVEMBER 1967

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APPENDIX B

CLEANING AND PRESERVING MATERIALS

NSN	Description
	BODY, GUIDED MISSILE
6810-00-264-6517	Acid, chromic chromium trioxide, technical, flake form, Spec O-C-303 (5 GL CN) Ref No. OC303TYPE25LBCN 5 LB CAN
8040-00-887-1450	Adhesive, polymerized acrylic resin base, clear liquid, heat and chemical resistant, used w/solvent (toluol) 40% solids, 1 GL CN, Ref No. 8607093
8040-00-701-9546	Adhesive, silicone rubber, paste form (5 oz tube) (FED-STD-313)
8040-00-844-9707	Adhesive, syn resin, liquid form, laminates to wood and S (1 PT PER CN) Ref No. 9978017
8040-00-721-9091	Adhesive, syn-ru, liquid form, 1 PT CN, w/separate catalyst Ref No. MILA25457-1 PT
8040-00-290-4301	Adhesive, syn-ru, liquid form, 1 QT CN, Ref No. 8162031, Ref No. MILA5092TYPE2
8040-00-262-9011	Adhesive, syn-ru, liquid form, 1 PT CN, Ref No. MILA5092TYPE3-1 PT
8040-00-264-5840	Adhesive, syn-ru, liquid, general bonding, 1 GL CN, Ref No. MILA13883, ORD, TYPE II, 1 GA CA
8040-00-887-5857	Adhesive, 3 parts of thermosetting liquid resin and 2 parts of polyamid resin, two to three hours pot life, air cure in six to eight hrs, 1 QT CN, Ref No. 9141496
6810-00-543-7415	Alcohol, denatured, formula No. 3A, 1 GL CN, Ref No. 0E760 GRADE 3
5350-00-286-4851	Aluminum wool, Ref No. MILA4864
8030-00-201-0996	Antiseize compound, asphalt, graphite, lubr oil petrolatum, and white lead ingredients, 1 PT CN, Ref No. TTA00580
8020-00-202-7266	Brush, paint, FL, hog bristle, SQ edge, 3 W, 7/8 thk, 3—1/4 exposed lg, FED SPEC H-B-0420, Class 1, Grade B, size 3, Ref No. 8034078
6850-00-224-6663	Cleaning compound, solvent solution type, 1 GA CA, Ref No. 9156817
6850-00-826-2156	Cleaning compound, solvent Type 1, 1 GA CA, Ref No. PC576ATYPE1, Ref No. PC444TYPE1
1420-00-475-1016	Cloth, lint free (9 in. sq 300 percent) Ref No. 9005198
8030-00-231-2345	Corrosion preventive compound, hard film, for cold application, 1 GL CN (CT) Ref No. MILC16173GRADE1
8030-00-244-1298	Corrosion preventive compound, solvent cutback, cold application, soft film, MIL-C-16173, GR2, 5 GL PL (CL)
6850-00-901-0591	Deicing-defrosting, Ref No. MILA8243A

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FSN	Description
6850-281-1985	Dry cleaning solvent, liquid form, for degreasing MTL and dry cleaning, 1 GL CN, Ref No. PD680TYPE1
6850-264-6574	Desiccant, activated, Type D-3464A, Class 2, four desiccant units per bag, Ref No. MKD3464-4, Ref No. 9024584 (U/O Ser No. 13,001 and subsequent)
6850-264-9038	Dry cleaning solvent, liquid form, to remove soil from surfaces in dry cleaning process, FEDP5661B, TYPE 1 (5 GL PL), Ref No. PD 680TY1-5GALPL
6850-264-9037	Dry cleaning solvent, liquid form, to remove soil from surfaces in dry cleaning process, PD680TY1-55 GAL DR, Ref No. 880PS661B, Type 1, 55GALDR1, 6GA, Ref No. PD680TY1-55 GAL DR
6850-285-8012	Dry cleaning solvent, liquid form, to remove soil from surfaces in dry cleaning process, FED-P-S-661B, Type 1, 55 GAL DR, 18 GA, Ref No. 51S4385-55
8010-828-3191	Enamel, brown, lusterless, 1 GL CN, Ref No. MILE10687, Ref No. TTE516
8010-297-3819	Enamel, green, eggshell gloss, 16 hr max air dry hard time, color 3412, FED-TT-C-595, MIL-E-12507, 1 QT CN
8010-297-2111	Enamel, insigna white, lusterless, for ammo, 1 GL CN, Ref No. TTE516-37875
8010-878-5761	Enamel, insigna white, lusterless, 1 PT CN, Ref No. TTE516-37875160ZCN
8010-297-2122	Enamel, jet black, lusterless, for ammo, 1 GL CN, Ref No. TTE516-37038
8010-297-2116	Enamel, OD, lusterless, for ammo, 1 GL CN, Ref No. TTE516-34087, Ref No. TTE516X34087, Ref No. MILE10687X34087
8010-914-3081	Enamel, OD, lusterless, solar heat reflecting, 1 GL CN, Ref No. MILE46096
8010-297-2112	Enamel, orange yellow, lusterless, for ammo, 1 GL CN, Ref No. TTE516-33538
8010-297-2114	Enamel, red, lusterless, quick drying, for ammo, FS-TT-C-595, MIL-E-10687, No. 31136, 1 GL CN
8010-286-7725	Enamel, black, gloss, 5 GL PL, Ref No. TTE489,A,BLK
8010-297-2121	Enamel, lusterless, FS-TT-C-595, MIL-E-10687, jet black, No. 37038, 1 QT CN, Ref No. 52-3423-010-025, Ref No. MILE10687-37038, Ref No. TTE516-37038
9150-269-8255	Grease, aircraft, w/gelling agent and liquid lubricant, low evaporation and oxidation resistant, 260 to 300 worked penetration at 77 deg F, 325 deg F min dropping pt, MILL4343A (1 LB CN) (GPS), Ref No. MILL4343, 1 LB CN
8520-527-9942	Hand cleaner, 1 PT CN, Ref No. PH31TYPE1CLASS1
9150-223-4134	Hydraulic fluid, petroleum base, corrosion and oxidation resistant, designed for syn-ru seal, 1 GL CN (DHA) Ref No. MS35900-219, Ref No. MILH5606

*U.S. GOVERNMENT PRINTING OFFICE: 1982--546-033/390

FSN	Description
5970-888-2954	Insulating compound, electrical liquid form, resistant to oil, acid and alkalies, 8 oz CN, Ref No. 9029986
5970-162-7523	Insulating varnish, electrical saltwater resistant, purple, Ref No. ZV903, Ref No. 9059935
5970-647-3676	Insulating varnish, electrical, air drying, clear, for general purpose use, 1 PT CN, Ref No. 9017118, Ref No. 8150350, Ref No. MILV173 1 PT
5970-285-0271	Insulating varnish, electrical, clear, air drying, resistant to fungus and moisture, 1 GL CN, Ref No. MS35632-1, Ref No. MILV173,1GA (U/C rocket motor igniters)
5970-184-2002	Insulation tape, electrical ins, ru, 3/4 in. w. 0.033 in. thk, Spec HH-T-111C, 30 FT RO, Ref No. 875910
5970-965-9639	Insulation tape, electrical ru, adhesive, 1—1/4 W. 0.02 thk, 12 yd lg, Ref No. MPD3350, (U/C Ser No. 13,001 and subsequent)
6810-286-543[illegible]	Ispropyl alcohol, 1 GL CN, Ref No. MIL-I-10428A, Ref No. TT-I-735, GRADE A
5970-548-9520	Insulating varnish, electrical clear, moisture and fungus resistant 1 QT CN, Ref No. MIL-V-173, TYPE 1 Clear
9150-754-0064	Lubricant, solid film, acetone 10 0/0 solid content, 12 oz spray CN, Ref No. MILL23398
9150-782-2627	Lubricating oil, aircraft, turbine engine, synthetic base, Ref No. MILL78081QTCA, Ref No. W14-0-2382, Ref No. MILL007808-1QTCN
9150-231-6689	Lubricating oil, general purpose corrosion and oxidation resistant, 1 QT CN (PL-SPECIAL), Ref No. MILL644, Ref No. VVL800
9150-252-6174	Lubricating oil, general purpose LT, Type V, Class 4, FEDVVL820 (1 QT CN)
9150-273-2389	Lubricating oil, general purpose noncorrosive, low temp, symbol PL SP, −7C deg F max pour PT, 275 deg F min flash PT, MIL-L-644A, amend 2, 4 OZ CN (PL-SPECIAL), Ref No. VVL800
6810-264-6715	Molybdenum disulfide, technical powder form, 1 LB CN, Ref No. MILM7866
6830-292-0732	Nitrogen, technical (Used for transferring ETO from commercial container into the fuel tank of the APS unit) (U/O Ser No. 10,206 thru 14,964)
5350-598-5537	Paper, abrasive flint, paper backing, closed coat, 9 x 10 SH, 100 SH SV, GR fine, Ref No. PP105CLASSZFINE
5350-598-6105	Paper, abrasive flint, paper backing, closed coat, 9 x 10 SH, 100 SH SV, GR med, Ref No. PP105CLASS2MEDIUM
5350-264-3483	Paper, abrasive flint, paper backing, closed coat, 9 x 10 SH, 50 SH SV, coarse GR, Ref No. PP105CLASSZCOARSE, Ref No. 42P01175120

FOR OFFICIAL USE ONLY

FSN	Description
5350-264-3485	Paper, abrasive flint, rope or wood FBR or kraft paper backing, closed-coat, 9 x 10 SH, 100 SH sleeve, P-P-105, Class 2, extra fine GR 4/0 or 3/0, Ref No. 42P01205000
8010-161-7419	Primer coating, 6 hr max air drying time for recoating, pigments C/P magnesium silicate stenna, titanium dioxide fin., clean yellow, 1 GL CN
8010-161-7339	Primer coating, yellow, corrosion resistant, 2 hr drying time, 1 GL CN, Ref No. TTP666
8010-582-5318	Primer coating, color T pretinted to match interior green Color No. 34151, 5 minutes drying time, 1 GL CN, Ref No. MILP8585A, Color T 34151
7920-205-1711	Rag, wiping, cotton, bleached or unbleached, mixture of white and colored, designed for general purpose use, Spec DDD-R-30, 50 LB BE, Ref No. MS16746-131, Ref No. DDDR300L2
8030-881-5238	Sealing compound, syn-ru, w/separate catalyst, semisolid, 1 QT CN, Ref No. MILS8516C, Class I
8030-262-9041	Sealing compound, syn-ru, paste form, block 1/2 PT CN, Ref No. 8050300, Ref No. MILS7124A12, Ref No. MILS7124
8030-721-8929	Sealing compound, syn-ru, semisolid, 1 QT CN Class A base, 1 QT CN Class B base, 1 JR Class B catalyst, w/two 8 OZ CN topcoat, MILS7502CLASSB2
8030-853-6649	Sealing compound liquid polymer, 100 GRAN CN or TU, Ref No. MPD 5010
6850-880-7616	Silicone compound (8 OZ per TU), Ref No. 10581521-1, Ref No. MILS8660
8520-228-0598	Soap, toilet, liquid form, 1 GL CO, Ref No. PS624-1
7920-240-2559	Sponge, cellulose, rectangular, Ref No. LS00626TYPEIICLASS2POROSITYA
6810-270-9989	Talc, technical powdered soap stone, ZZ-T-416A Type IV, Class C, 1 LB sifter type can w/cap
1420-875-6300	Tape, insulation, ru silicone, 1-1/4 x 72 FT RL, Ref No. 9027250, (U/O Ser No. 10,206 and subsequent)
8030-772-2941	Tape, pressure sensitive, adhesive AL foil, w/silicone adhesive, 1 W, 0.002 thk (36 YD per RL), Ref No. 9020003
7510-756-9470	Tape, pressure sensitive adhesive cloth backing, coated w/adhesive on both sides, heat and moisture resistance, 1 w (50 FT RO), Ref No. 9021502
8030-775-2310	Tape, pressure sensitive adhesive, fiberglass, adhesive, 1.5 w, 0.009 thk (72 YD per RL), Ref No. 9027208
7510-266-6711	Tape, pressure sensitive adhesive, paper backing, opaque, FED-UU-T-106A, Type 1, 3/4 w
8010-242-2089	Thinner, paint, mineral spirits, 302 to 410 deg F distillation range, 1 GL CN, Ref No. FEDTTT291A, 1 GA CA

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FSN	Description
8010-558-7026	Thinner, paint, mineral spirits, 340 to 485 deg F distillation range, TT-T-291AGR1, 5 GL PL
8010-087-1953	Thinner, synthetic resin enamel, 257 to 410 deg F distillation range, 1 QT CN, Ref No. TTT306
8010-254-4218	Thinner, synthetic resin enamel, 257 to 410 deg F distillation range, FED-TT-T-306, 53 GL DR, Ref No. TTT306-1
6810-281-2002	Toluene, technical, 1 GL CN, Ref No 9060184, Ref No. TTT548
6810-184-4794	Trichloroethylene, technical (5 GL DR), Ref No. OT634-2
6810-664-0387	Trichloroethane, technical, inhibited, 1 GL CN, Ref No. OT620
6850-285-9432	Wetting agent, sodium alkyl aryl sulfonate active ingredient, liquid form, water solvent, 1 QT CN, Ref No. 8162033
1430-00-593-7839	Tape, nylon lacing, waxed, type P, MIL-T-713, Ref No. 9010157
8030-530-6375	Tape, opaque white, adhesive corrosion, resistant 1" 12/48, Ref No. MIL-T-4053B
8010-721-9752	Lacquer, brass, acrylic resin 1 PT pressurized can, Ref No. FED SPEC TTL-50
6850-984-5853	Cleaning compound, solvent, Ref No. MIL-C-81302 5 Gal

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TM 9-1410-250-24P/1/

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

TECHNICAL MANUAL

ORGANIZATIONAL, DS AND GS MAINTENANCE
REPAIR PARTS AND SPECIAL TOOLS LIST
FOR
GUIDED MISSILE, INTERCEPT-AERIAL
MIM-14A AND MIM-14B ROCKET
MOTOR CLUSTER, TRAINING,
M29 (FSN 6920-580-6481)
BODY SECTION, GUIDED MISSILE
TRAINING, M84 (FSN 6920-893-3163)
SHIPPING AND STORAGE CONTAINER
GUIDED MISSILE TRANSPONDER
M466 (FSN 8140-724-3014)
(NIKE-HERCULES/IMPROVED HERCULES
AIR DEFENSE GUIDED MISSILE SYSTEM)

HEADQUARTERS, DEPARTMENT OF THE ARM

DECEMBER 197

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SECTION II. REPAIR PARTS AND SPECIAL TOOLS LIST

(1) SM & R CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEAS	(5) QUANTITY INCORPORATED IN UNIT	(6) 15 DAY ORG. MAINT. ALLOW. CO. BTRY. BN.	(7) ILLUSTRATI (A) FIGURE NUMBER	ITEM
		AMMUNITION					
		GUIDEC MISSILE, INTERCEPT-AERIAL MIM-14A ANC MIM-14B					
		ORGANIZATIONAL MAINTENANCE TOOLS AND EQUIPMENT					
		NONE AUTHORIZEC					
		CLEANING ANC PRESERVING MATERIALS					
		AMMUNITION COMPONENTS OF GUICEC MISSILE, INTERCEPT-AERIAL MIM-14A ANC MIM-14B					
---- 1	8040-262-9011	ADHESIVE SYN-RU, LIGLID FORM, 1 PT CN REF NO. MILA5092TYPE3-1PT C	PT	AR	•	-	
---- 2	8010-297-2116	ENAMEL OC, LUSTERLESS, FOR AMMO, 1 GL CN REF NO. TTE516-34C87 REF NO. TTE516X34087	GL	AR	•	-	
---- 3	5970-647-3676	INSULATING VARNISH, ELECTRICAL AIR CRYING, CLEAR, FOR GENERAL PURPOSE USE, 1 PT CN REF NO. 9017118 REF NO. 815C350 REF NO. MILV173 1 PT C	EA	AR	•	-	
---- 4	5970-285-0271	INSULATING VARNISH, ELECTRICAL CLEAR, AIR CRYING, RESISTANT TC FUNGUS ANC MOISTURE, 1 GL CN REF NO. MS35632-1 REF NO. MILV173,1GA C	GL	AR	•	-	
---- 5	6830-292-0732	NITROGEN, TECHNICAL REF NO. - (USEC FOR TRANSFERRING ETO FROM COMMERCIAL CONTAINER INTO THE FUEL TANK OF THE APS UNIT) C	CF	AR	•	-	
---- 6	8010-582-5318	PRIMER COATING COLOR T PRETINTED TO MATCH INTERIOR GREEN COLOR NO. 34151, 5 MINUTES CRYING TIME, 1 GL CN REF NO. MILP8585A, COLOR T 34151 C	GL	AR	•	-	
---- 7	8030-853-6649	SEALING COMPOUNC LICUID POLYMER, 10C GRAM CN CR TU REF NO. MPC 501C C	EA	AR	•	-	
		REPAIR PARTS FOR MAJOR ITEMS					
		SHIPPING AND STORAGE CONTAINER, GUIDED MISSILE BODY SECTION, M410					
		NONE AUTH					

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(1) SM & R CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION		(4) UNIT OF MEAS	(5) QUANTITY INCORPORATED IN UNIT	(6) 15 DAY ORG. MAINT. ALLOW. CO. BTRY. BN.	(7) ILLUSTRATIO (A) FIGURE NUMBER	(B) ITEM
		CLEANING AND PRESERVING MATERIALS						
		BODY, GUIDED MISSILE						
---- 235	6810-264-6517	ACID, CHROMIC CHROMIUM TRIOXIDE, TECHNICAL, FLAKE FORM, SPEC C-C-303 (5 GL CN) REF NO. OC3C3TYPE25LBCN 5 LB CAN	C	LB	AR	*	-	
---- 236	8040-844-9707	ADHESIVE SYN RESIN, LIQUID FORM, LAMINATES TO WOOD AND S (1 PT PER CN) REF NO. 9978017		PT	AR	*	-	-
P-O- 237	8040-721-9091	ADHESIVE SYN-RU, LIQUID FORM, 1 PT CN W/SEPARATE CATALYST REF NO. MIL425457-1PT		KT	AR	*	-	-
---- 238	8040-290-4301	ADHESIVE SYN-RU, LIQUID FORM, 1 QT CN REF NO. 8162031 REF NO. MIL45092TYPE2		QT	AR	*	-	-
---- 239	8040-264-5840	ADHESIVE SYN-RU, LIQUID, GENERAL BONDING, 1 GL CN REF NO. MIL413883,CRD,TYPE II, 1 GA CA		GL	AR	*	-	-
---- 240	8040-262-9011	ADHESIVE SYN-RU, LIQUID FORM, 1 PT CN REF NO. MIL45092TYPE3-1PT		PT	AR	*	-	-
---- 241	8020-242-7266	BRUSH, PAINT FL, HOG BRISTLE, SC EDGE, 3 W, 7/8 THK, 3-1/4 EXPOSED LG, FED SPEC H-B-042C, CLASS 1, GRADE B, SIZE 3 REF NO. 8034078		EA	AR	*	-	-
---- 242	6850-224-6663	CLEANING COMPOUND, SOLVENT SOLUTION TYPE, 1 GA CA REF NO. 9156817		GL	AR	*	-	-
---- 243	6850-826-2156	CLEANING COMPOUND, SOLVENT TYPE 1, 1 GA CA REF NO. PC576ATYPE1 REF NO. PC444TYPE1		GL	AR	*	-	-
P-O- 244	8030-231-2345	CORROSION PREVENTIVE COMPOUND HARD FILM, FOR COLD APPLICATION, 1 GL CN (CT) REF NO. MILC16173GRADE1		GL	AR	*	-	-
---- 245	8030-244-1298	CORROSION PREVENTIVE COMPOUND SOLVENT CUTBACK, COLD APPLICATION, SOFT FILM, MIL-C-16173, GR2, 5 GL PL (CL) REF NO. -	C	PL	AR	*	-	-
---- 246	6850-901-0591	DEICING-DEFROSTING REF NO. MIL48243A	C	GL	AR	*	-	-
---- 247	6850-264-9038	DRY CLEANING SOLVENT LIQUID FORM, TO REMOVE SOIL FROM SURFACES IN DRY CLEANING PROCESS FEDPS661B, TYPE 1 (5 GL PL) REF NO. PD680TY1-5GALPL		GL	AR	*	-	-

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(1) SM & R CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEAS	(5) QUANTITY INCORPORATED IN UNIT	(6) 15 DAY ORG. MAINT. ALLOW. CO. BTRY. BN.	(7) ILLUSTRATION (A) FIGURE NUMBER	(B) ITEM NUMBER
---- 248	6850-264-9037	DRY CLEANING SOLVENT C LIQUID FORM, TO REMOVE SOIL FROM SURFACES IN DRY CLEANING PROCESS, PD680TY1-55 GAL DR REF NO. FEDPS661B,TYPE1,55GALDR1,6GA REF NO. PD680TY1-55 GAL DR	GL	AR	*	-	-
---- 249	6850-281-1985	DRY CLEANING SOLVENT LIQUID FORM, FOR DEGREASING MTL AND DRY CLEANING, 1 GL CN REF NO. PD680TYPE1	GL	AR	*	-	-
---- 250	6850-285-8012	DRY CLEANING SOLVENT LIQUID FORM, TO REMOVE SOIL FROM SURFACES IN DRY CLEANING PROCESS, FED-P-S-661B, TYPE 1, 55 GAL DR, 18 GA REF NO. 51S4385-55	GL	AR	*	-	-
---- 251	8010-828-3191	ENAMEL BROWN, LUSTERLESS, 1 GL CN REF NO. MILE10687 REF NO. TTE516	GL	AR	*	-	-
---- 252	8010-297-3619	ENAMEL GREEN, EGGSHELL GLOSS, 16 HR MAX AIR DRY HARD TIME, COLOR 3412, FED-TT-C-595, MIL-E-12507, 1 QT CN REF NO. -	QT	AR	*	-	-
P-O- 253	8010-878-5761	ENAMEL A INSIGNA WHITE, LUSTERLESS, 1 PT CN REF NO. TTE516-37875I6CZCN	PT	AR	*	-	-
---- 254	8010-297-2111	ENAMEL INSIGNA WHITE, LUSTERLESS, FOR AMMO, 1 GL CN REF NO. TTE516-37875	GL	AR	*	-	-
---- 255	8010-297-2122	ENAMEL JET BLACK, LUSTERLESS, FOR AMMO, 1 GL CN REF NO. TTE516-37038	GL	AR	*	-	-
---- 256	8010-297-2116	ENAMEL OD, LUSTERLESS, FOR AMMO, 1 GL CN REF NO. TTE516-34087 REF NO. TTE516X34087	GL	AR	*	-	-
---- 257	8010-914-3081	ENAMEL OD, LUSTERLESS, SOLAR HEAT REFLECTING 1 GL CN REF NO. MILE46096	GL	AR	*	-	-
---- 258	8010-297-2112	ENAMEL ORANGE YELLOW, LUSTERLESS, FOR AMMO, 1 GL CN REF NO. TTE516-33538	GL	AR	*	-	-
---- 259	8010-297-2114	ENAMEL RED, LUSTERLESS, QUICK DRYING, FOR AMMO, FS-TT-C-595, MIL-E-10687, NO. 31136, 1 GL CN REF NO. -	GL	AR	*	-	-
---- 260	9150-269-8255	GREASE, AIRCRAFT W/GELLING AGENT AND LIQUID LUBRICANT, LOW EVAPORATION AND OXIDATION RESISTANT, 260 TO 300 WORKED PENETRATION AT 77 DEG F, 325 DEG F MIN DROPPING PT, MILL4343A (1 LB CN) (GPS) REF NO. MILL4343, 1 LB CAN	LB	AR	*	-	-

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(1) SM & R CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION		(4) UNIT OF MEAS	(5) QUANTITY INCORPORATED IN UNIT	(6) 15 DAY ORG. MAINT. ALLOW. CO. BTRY. BN.	(7) ILLUSTRATION (A) FIGURE NUMBER	(7) ILLUSTRATION (B) ITEM NUMBER
---- 261	6520-527-9942	HAND CLEANER 1 PT CN REF NO. PH31TYPE1CLASS1	C	PT	AR	*	-	-
---- 262	9150-933-5278	HYCRAULIC FLUIC, PETROLEUM BASE REF NO. M1S10137		GL	AR	*	-	-
---- 263	9150-223-4134	HYCRAULIC FLUIC, PETROLEUM BASE CORROSION AND OXICATION RESISTANT, CESIGNEC FOR SYN-RU SEAL, 1 GL CN (OHA) REF NO. MS35900-219 REF NO. MILH5606		GL	AR	*	-	-
---- 264	9150-698-3822	HYCRAULIC FLUIC, PETROLEUM BASE YELLOW, OXICATION RESISTANT, 2.8 CENTISTOKES AT 100 DEG F MIN VISCOSITY, 300 CENTISTOKES AT 65 DEG F MAX VISCOSITY, 200 DEG F MIN FLASH PT BY CLEVELAND OPEN-CUP TEST METHOD, 75 DEG F MAX POUR PT, CESIGNEC FOR SYN-RU SEAL, MPD-2067 (1 GL CN) (OHA) REF NO. 8523877 REF NO. MILH46004	C	GL	AR	*	-	-
---- 265	7510-179-0451	INK, MARKING STENCIL YELLOW, LIQUID, OPAQUE, 1 GL CN REF NO. TTI558-33538		GL	AR	*	-	-
P--- 266	5970-888-2954	INSULATING COMPOUND, ELECTRICAL LIQUID FORM, RESISTANT TO OIL, ACID AND ALKALIES, 8 OZ CN REF NO. 9025986		OZ	AR	*	-	-
---- 267	5970-162-7523	INSULATING VARNISH, ELECTRICAL SALTWATER RESISTANT, PURPLE REF NO. ZV9C3 REF NO. 9059935	C	EA	AR	*	-	-
---- 268	5970-184-2002	INSULATION TAPE, ELECTRICAL INS, RU, 3/4 IN. W, 0.033 IN. THK, SPEC MH-T-111C, 30 FT RO REF NO. 875910		FT	AR	*	-	-
---- 269	5970-965-9633	INSULATION TAPE, ELECTRICAL RU, ADHESIVE, 1-1/4 W, 0.02 THK, 12 YD LG REF NO. MPC3350 (U/O SER NO. 13,001 AND SUBQ.)	C	FT	AR	*	-	-
---- 270	9150-754-0064	LUBRICANT, SOLID FILM ACETONE 10 C/O SOLID CONTENT, 12 OZ SPRAY CN REF NO. MILL23398	C	OZ	AR	*	-	-
---- 271	9150-782-2627	LUBRICATING OIL, AIRCRAFT, TURBINE ENGINE, SYNTHETIC BASE REF NO. MILL7808ICTCA REF NO. W14-0-2382 REF NO. MILL007808-10TCN	N	CT	AR	*	-	-
---- 272	9150-231-6689	LUBRICATING OIL, GENERAL PURPOSE CORROSION AND OXIDATION RESISTANT, 1 QT CN (PL-SPECIAL) REF NO. MILL644 REF NO. VVLE00		QT	AR	*	-	-
---- 273	9150-252-6174	LUBRICATING OIL, GENERAL PURPOSE LT, TYPE V, CLASS 4, FEDVVL820 (1 QT CN) REF NO. -		QT	AR	*	-	-

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---- 274	9150-273-2389	LUBRICATING OIL, GENERAL PURPOSE NONCORROSIVE, LOW TEMP, SYMBOL PL SP, - 70 DEG F MAX POUR PT, 275 DEG F MIN FLASH PT, MIL-L-644A, AMEND 2, 4 OZ CN (PL-SPECIAL) REF NO. VVL800	C	CZ	AR	•	-	-
---- 275	6810-264-6715	MOLYBDENUM DISULFIDE, TECHNICAL POWDER FORM, 1 LB CN REF NO. MILM7866		LB	AR	•	-	-
---- 276	5350-598-5537	PAPER, ABRASIVE FLINT, PAPER BACKING, CLOSED COAT, 9 X 10 SH, 100 SH SV, GR FINE REF NO. PP1C5CLASSZFINE	C	EA	AR	•	-	-
---- 277	5350-598-6105	PAPER, ABRASIVE FLINT, PAPER BACKING, CLOSED COAT, 9 X 10 SH, 100 SH SV, GR MED REF NO. PP1C5CLASS2MEDIUM	K	EA	AR	•	-	-
---- 278	5350-264-3483	PAPER, ABRASIVE FLINT, PAPR BACKING, CLOSED COAT, 9 X 10 SH, 50 SH SV, COARSE GR REF NO. PP1C5CLASSZCOARSE REF NO. 42PC117512C		SH	AR	•	-	-
---- 279	5350-264-3485	PAPER, ABRASIVE FLINT, ROPE OR WOOD FBR OR KRAFT PAPR BACKING, CLOSED-COAT, 9 X 10 SH, 100 SH SLEEVE, P-P-105, CLASS 2, EXTRA FINE GR 4/0 OR 3/0 REF NO. 42PC12050CC		SH	AR	•	-	-
---- 280	8010-161-7419	PRIMER COATING 6 HR MAX AIR DRYING TIME FOR RECOATING, PIGMENTS C/O MAGNESIUM SILICATE SIENNA, TITANIUM DIOXIDE FIN., CLEAN YELLOW 1 GL CN REF NO. -		GL	AR	•	-	-
---- 281	8010-161-7339	PRIMER COATING YELLOW, CORROSION RESISTANT, 2 HR DRYING TIME, 1 GL CN REF NO. TTP666		GL	AR	•	-	-
---- 282	7920-205-1711	RAG, WIPING COTTON, BLEACHED OR UNBLEACHED, MIXTURE OF WHITE AND COLORED, DESIGNED FOR GENERAL PURPOSE USE, SPEC DDD-R-30, 50 LB BE REF NO. MS16746-131 REF NO. DDDR30CL2		LB	AR	•	-	-
---- 283	8030-721-8929	SEALING COMPOUND SYN-RU, SEMISOLID, 1 QT CN CLASS A BASE, 1 QT CN CLASS B BASE, 1 JR CLASS A CATALYST, 1 JR CLASS B CATALYST, W/TWO 8 OZ CANS TOPCOAT REF NO. MILS75C2CLASSB2		KT	AR	•	-	-
---- 284	6850-880-7616	SILICONE COMPOUND (8 OZ PER TU) REF NO. 10581521-1 REF NO. MILS8660		CZ	AR	•	-	-
---- 285	8520-228-0598	SOAP, TOILET LIQUID FORM, 1 GL CO REF NO. PS624-1		GL	AR	•	-	-
---- 286	7920-240-2559	SPONGE, CELLULOSE, RECTANGULAR REF NO. LSCC626TYPEIICLASS2POROSITYA		EA	AR	•	-	-

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---- 287	7920-267-4923	SPONGE, VINYL RECT SHAPE, 3-3/4 W, 2-3/4 THK, 6-3/4 LG, MIL-S-11036, TYPE 1, CLASS 2 REF NO. -	EA	AR	•	-	
---- 288	6510-270-9989	TALC, TECHNICAL POWDERED SOAP STONE, ZZ-T-416A, TYPE IV CLASS C, 1 LB SIFTER TYPE CAN W/CAP REF NO. -	LB	AR	•	-	
---- 289	7510-756-9470	TAPE, PRESSURE SENSITIVE ADHESIVE CLOTH BACKING, COATED W/ADHESIVE ON BOTH SIDES, HEAT AND MOISTURE RESISTANCE, 1 W (5C FT RO) REF NO. 9021502	EA	AR	•	-	
---- 290	7510-266-6711	TAPE, PRESSURE SENSITIVE ADHESIVE PAPR BACKING, OPAQUE, FED-UU-T-106A, TYPE 1, 3/4 W REF NO. -	YD	AR	•	-	
---- 291	8010-242-2089	THINNER, PAINT, MINERAL SPIRITS 302 TO 410 DEG F DISTILLATION RANGE, 1 GL CN REF NO. FEDTTT291A, 1 GA CA	GL	AR	•	-	
---- 292	8010-558-7026	THINNER, PAINT, MINERAL SPIRITS 340 TO 485 DEG F DISTILLATION RANGE, TT-T-291AGR1. 5 GL PL REF NO. -	GL	AR	•	-	
---- 293	8010-087-1953	THINNER, SYNTHETIC RESIN ENAMEL 257 TO 410 DEG F DISTILLATION RANGE, 1 QT CN REF NO. TTT306 C	PT	AR	•	-	
---- 294	8010-254-4218	THINNER, SYNTHETIC RESIN ENAMEL 257 TO 410 DEG F DISTILLATION RANGE, FED-TT-T-306, 55 GL DR REF NO. TTT306-1	GL	AR	•	-	
---- 295	6810-281-2002	TOLUENE, TECHNICAL 1 GL CN REF NO. 9060184 REF NO. TTT548	GL	AR	•	-	
---- 296	6810-184-4794	TRICHLOROETHYLENE, TECHNICAL (5 GL DR) REF NO. OT634-2 C	GL	AR	•	-	
---- 297	6810-664-0387	TRICHLOROETHANE, TECHNICAL INHIBITED, 1 GL CN REF NO. OT620	GL	AR	•	-	
---- 298	6850-285-9432	WETTING AGENT SODIUM ALKYL ARYL SULFONATE ACTIVE INGREDIENT, LIQUID FORM, WATER SOLVENT, 1 QT CAN REF NO. 8162033 C	PT	AR	•	-	

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FOR OFFICIAL USE ONLY

TM 9-1410-250-24P-2-1

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

MHRC COPY

TECHNICAL MANUAL

ORGANIZATIONAL, DS AND GS MAINTENANCE
REPAIR PARTS AND SPECIAL TOOLS LIST
(INCLUDING DEPOT MAINTENANCE
REPAIR PARTS AND SPECIAL TOOLS)
FOR
SIMULATOR, GUIDED MISSILE
FLIGHT OA-1543C/M
(FSN 4935-084-2972)
MISSILE GUIDANCE SET
AN/DPW-17, AN/DPW-17A
OR AN/DPW-17B
MISSILE GUIDANCE SET
AN/DPW-18 OR AN/DPW-18A
(NIKE-HERCULES/IMPROVED HERCULES
AIR DEFENSE GUIDED MISSILE SYSTEM)

HEADQUARTERS, DEPARTMENT OF THE ARMY

SECTION II. REPAIR PARTS AND SPECIAL TOOLS LISTS

(1) SM & R CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEAS	(5) QUANTITY INCORPORATED IN UNIT	(6) 15 DAY ORG. MAINT. ALLOW. CO. BTRY. BN.	(7) ILLUSTRATION (A) FIGURE NUMBER	(7) ILLUSTRATION (B) ITEM NUMBER
		ORGANIZATIONAL MAINTENANCE TOOLS AND EQUIPMENT					
		SIMULATOR, GUIDED MISSILE FLIGHT OA-1643C/M (9989312)					
		NONE AUTHORIZED					
		REPAIR PARTS FOR MAJOR ITEMS					
		SIMULATOR, GUIDED MISSILE FLIGHT OA-1643C/M (9989312)					
P-OS 1	4935-897-7297	AMPLIFIER-DECODER REF NO. 9158653 (REPLACES 9006519 AFTER DA MWO 9-1430-250-30/2 IS APPLIED.)	EA	1	*	-	-
P-OS 2	1420-701-4627	CONVERTER, SIGNAL DATA C/O DETONATION CONTROL, PULSE DEMODULATOR, DELAY PULSE GENERATOR, SIGNAL DATA CONVERTER SUB ASSY, GUARDS, HANDLES AND ATTACHING HARDWARE, 9-15/16 DIA, 4.156 H, W/4 6-32 THD SCREWS REF NO. 9001921	EA	1	1	-	-
P-O- 3	5935-258-4449	COVER, ELECTRICAL CONNECTOR CORROSION RESISTANT MTL, 1 DIA, 5/8 LG, W/CHAIN REF NO. 8176471 REF NO. 10606730-1 REF NO. 10609518-1 REF NO. CW339U	EA	1	*	-	-
P-O- 4	1420-568-8284	DELAY LINE REF NO. 8512414	EA	1	*	-	-
P-OF 5	1420-613-8797	DETECTOR DRIVER, DELAY LINE C/O CHASSIS, COVER, RESISTOR ASSY, 2 AMP VIDEO ASSY, PULSE OSCILLATOR, 6 CONNECTORS AND ATTACHING HARDWARE, MTD BY THREE NC. 8-32 SCREWS, 5-1/16, 3-9/32 H, 7-13/32 LG REF NO. 9006809	EA	1	*	-	-
P-OR 6	1430-573-0749	DETECTOR, RADIO FREQUENCY CONNECTOR J1 LOCATED ON LEFT SIDE REF NO. 8172699	EA	1	*	-	-
P-OR 7	1430-568-8304	DETECTOR, RADIO FREQUENCY C/O 2 CONNECTORS, 1-1/4 W, 3 H, 2-5/16 LG REF NO. 8023123 REF NO. 8172668	EA	1	*	-	-
P-O- 8	5960-636-0001	ELECTRON TUBE TYPE RK6229/6230 REF NO. 8170564 REF NO. 9006567	EA	1	*	-	-
P-O- 9	4130-546-2233	FILTER ELEMENT, AIR PERMANENT TYPE, AL FILTERING MED, MTL FRAME, 89 CFM, 6-1/2 W, 1/2 THK, 6-1/2 H REF NO. 9003200 C	EA	1	*	-	-
P-O- 10	4130-322-7829	FILTER ELEMENT, AIR PERMANENT TYPE, AL SCREEN, MTL FRAME, 5 W, 1 THK, 7-1/2 LG REF NO. 8175686 C	EA	1	*	-	-

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(1) SM & R CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEAS	(5) QUANTITY INCORPORATED IN UNIT	(6) 15 DAY ORG. MAINT. ALLOW. CO. BTRY. BN.	(7) ILLUSTRATION (A) FIGURE NUMBER	(7) ILLUSTRATION (B) ITEM NUMBER
P-OT 11	1420-341-2353	MODULATOR, RADAR 4,000 V PEAK PULSE OUTPUT, 0.25 USEC. 2,000 PULSE PER SEC REPETITION RATE, 2-5/8 X 3-19/32 X 5-3/32 REF NO. 8023058	EA	1	*	-	-
P-OR 12	4935-807-7812	RELAY ASSEMBLY AL MTG BOARD, 2 W, 0.064 H, 4.5 LG REF NO. 8511415	EA	1	*	-	-
P-O- 13	5960-860-7709	SHIELD, ELECTRON TUBE REF NO. 10034220-2 REF NO. M24251-6-2	EA	1	*	-	-
P-O- 14	5961-898-4234	SEMICONDUCTOR DEVICE, DIODE REF NO. 9976139	EA	2	*	-	-
		CLEANING AND PRESERVING MATERIALS					
		SIMULATOR, GUIDED MISSILE FLIGHT OA-1643C/M (9989312)					
---- 15	6850-281-1985	DRY CLEANING SOLVENT LIQUID FORM, FOR DEGREASING MTL AND DRY CLEANING, 1 GL CN REF NO. PD680TYPE1	GL	AR	*	-	-
---- 16	6810-664-0387	TRICHLOROETHANE, TECHNICAL INHIBITED, 1 GL CN REF NO. OT620	GL	AR	*	-	-

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FOR OFFICIAL USE ONLY

(1) SM & R CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION		(4) UNIT OF MEAS	(5) QUANTITY INCORPORATED IN UNIT	(6) 15 DAY ORG. MAINT. ALLOW. CO. BTRY. BN.	(7) ILLUSTRATION (A) FIGURE NUMBER	(B) ITEM NUMBER
P-O-28	1420-612-3030	DELAY LINE GA1O424-L14 REF NO. 9007625		EA	AR	*	-	-
P-O-29	1420-612-3031	DELAY LINE GA1C424-L15 REF NO. 9007626		EA	AR	*	-	-
P-O-30	1420-612-3032	DELAY LINE GA1C424-L16 REF NO. 9007627		EA	AR	*	-	-
P-O-31	6850-264-6574	DESICCANT, ACTIVATED TYPE O-3464A, CLASS 2, FOUR DESICCANT UNITS PER BAG REF NO. MILD3464-4 REF NO. 9024584		LB	AR	*	-	-
P-OT 32	1420-613-8797	DETECTOR DRIVER, DELAY LINE C/O CHASSIS, COVER, RESISTOR ASSY, 2 AMP VIDEO ASSY, PULSE OSCILLATOR, 6 CONNECTORS AND ATTACHING HARDWARE, MTD BY THREE NO. 8-32 SCREWS, 5-1/16, 3-9/32 H, 7-13/32 LG REF NO. 9006809 (U/O SER NO. 10,206 THRU 11,970.)	C	EA	1	1	-	-
P-OR 33	1430-568-8304	DETECTOR, RADIO FREQUENCY C/O 2 CONNECTORS, 1-1/4 W, 3 H, 2-5/16 LG REF NO. 8023123 REF NO. 8172668		EA	1	*	-	-
P-OR 34	1430-573-0749	DETECTOR, RADIO FREQUENCY CONNECTOR J1 LOCATED ON LEFT SIDE REF NO. 8172699 (U/O SER NO. 10,206 THRU 11,970.)	C	EA	1	*	-	-
P-O-35	5960-284-9285	ELECTRON TUBE TYPE 5727/2D21W REF NO. 9000897 REF NO. 5727/2D21W (U/C SER NO. 10,206 THRU 11,970.)	C	EA	1	1	-	-
P-O-36	5960-503-4880	ELECTRON TUBE (R) TYPE OA2WA REF NO. 8034150 REF NO. OA2WA (U/C SER NO. 10,206 THRU 11,970.)	C	EA	3	*	-	-
P-O-37	5960-636-0001	ELECTRON TUBE TYPE RK6229/6230 REF NO. 8170564 REF NO. 9006567 (U/C SER NO. 10,206 THRU 11,970.)	C	EA	1	*	-	-
P-O-38	1420-591-2997	HORN, WAVEGUIDE GS18756-L1 REF NO. 8520831		EA	AR	*	-	-
P-O-39	1420-591-3473	HORN, WAVEGUIDE GS18756-L2 REF NO. 8520832		EA	AR	*	-	-
P-O-40	1420-591-2998	HORN, WAVEGUIDE GS18756-L3 REF NO. 8520833		EA	AR	*	-	-
P-O-41	1420-591-2999	HORN, WAVEGUIDE GS18756-L4 REF NO. 8520834		EA	AR	*	-	-

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FOR OFFICIAL USE ONLY

SM & R CODE	FEDERAL STOCK NUMBER	DESCRIPTION	UNIT OF MEAS	QUANTITY INCORPORATED IN UNIT	15 DAY ORG. MAINT. ALLOW. CO. BTRY. BN.	(A) FIGURE NUMBER	(B) ITEM NUMBER
		CLEANING AND PRESERVING MATERIALS					
		MISSILE GUIDANCE SET AN/DPW-17 (90C2298), AN/DPW-17A (9141683), OR AN/DPW-17B (9015783)					
---- 68	8030-262-9041	SEALING COMPCUND SYN-RU, PASTE FORM, BLACK, 1/2 PT CN REF NO. 8050300 REF NO. MILS7124A12 REF NO. MILS7124	PT	AR	*	-	-

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FOR OFFICIAL USE ONLY

(1) SM & R CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEAS	(5) QUANTITY INCORPORATED IN UNIT	(6) 15 DAY ORG. MAINT. ALLOW. CO. BTRY. BN.	(7) ILLUSTRATION (A) FIGURE NUMBER	(B) ITEM NUMBER
P-O- 82	1420-614-0556	WAVEGUIDE ASSEMBLY C FLEX, V SHAPED W/TWISTS AND OFFSET BENDS, 6-5/16 W, 13 LG REF NO. 9007631 (U/C SER NO. 13,001 AND SUBQ.)	EA	1	*	-	-
P-O- 83	1420-614-0557	WAVEGUIDE ASSEMBLY C U BEND TYPE, 7/8 RAD OF BEND, ONE LEG 2.898 LG, OTHER LEG 5-1/16 LG REF NO. 9009558 (U/C SER NO. 13,001 AND SUBQ.)	EA	1	*	-	-
		CLEANING AND PRESERVING MATERIALS					
		MISSILE GUIDANCE SET AN/DPW-18 (9017423) OR AN/DPW-18A (9149099) OR AN/DPW-2 (10666975)					
---- 84	6810-543-7415	ALCOHOL, DENATURED FORMULA NO. 3A, 1 GL CN REF NO. OE760GRADE3	GL	AR	*	-	-
---- 85	8030-201-0996	ANTISIEZE COMPOUND ASPHALT, GRAPHITE, LUBR OIL, PETROLATUM, AND WHITE LEAD INGREDIENTS, 1 PT CN REF NO. TTA580 REF NO. TTA00580	PT	-	*	-	-
---- 86	6850-224-6663	CLEANING COMPOUND, SOLVENT SOLUTION TYPE, 1 GA CA REF NO. 9156817	GL	AR	*	-	-
---- 87	6850-880-7616	SILICONE COMPOUND (8 OZ PER TU) REF NO. 10581521-1 REF NO. MILS8660	OZ	AR	*	-	-
---- 88	6810-664-0387	TRICHLOROETHANE, TECHNICAL INHIBITED, 1 GL CN REF NO. OT620	GL	AR	*	-	-

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FOR OFFICIAL USE ONLY

SM & R CODE	FEDERAL STOCK NUMBER	DESCRIPTION	UNIT OF MEAS	QUANTITY INCORPORATED IN UNIT	ALLOWANCE (A) DIRECT SUPPORT MAINT	(B) GENERAL SUPPORT MAINT	DEPOT MAINT AL PER 100 EQUIP	(A) FIGURE NUMBER	(B) ITEM NUMBER
P-D-148	1420-573-0760	RECEIVER, TRANSMITTER SUBASSEMBLY C/O COP. CLAD LAMINATED NYLON TERM. BOARD AND 10 COILS, 2 SQ, 1/16 THK REF NO. 8512421	EA	1	-	-	5	-	-
P-D-149	5945-295-3270	RELAY, ARMATURE 110 V AC, 3 AMP RESISTIVE CUR., 24 V DC, 3 AMP RESISTIVE CUR., 1 W, 1-9/32 H, 1-19/32 LG REF NO. 8175668	EA	1	-	-	5	-	-
P-D-150	5945-535-4371	RELAY, ARMATURE SPDT, 115 V AC, 1 AMP, 4-15/16 LG REF NO. 8518360 REF NO. 8518360-2	EA	1	-	-	5	-	-
P-OR 151	4935-807-7812	RELAY ASSEMBLY AL MTG BOARD, 2 W, 0.064 H, 4.5 LG REF NO. 8511415	EA	1	1	*	5	-	-
P-D-152	5905-110-0992	RESISTOR, FIXED, COMPOSITION REF NO. RCR32G511JS	EA	1	-	-	10	-	-
P-D-153	5905-104-5755	RESISTCR, FIXED, COMPOSITION 1/2 W, 10 OHMS, TYPE RCR20G100JS (+- 5 0/0) REF NO. RCR20G100JS	EA	1	-	-	10	-	-
P-D-154	5905-106-9344	RESISTCR, FIXED, COMPOSITION 1/2 W, 100 OHMS, TYPE RCR20G101JS (+- 5 C/O) REF NO. RCR20G101JS	EA	2	-	-	20	-	-
P-F-155	5905-141-0727	RESISTOR, FIXED, COMPOSITION 1/2 W, 200 OHMS, TYPE RCR20G201JS (+- 5 0/0) REF NO. 8307-34 REF NO. RCR20G201JS	EA	1	-	-	10	-	-
P-D-156	5905-114-5407	RESISTOR, FIXED, CCMPOSITION 1/2 W, 270 OHMS, TYPE RCR20G271JS (+- 5 0/0) REF NO. RCR20G271JS	EA	1	-	-	10	-	-
P-D-157	5905-935-8541	RESISTOR, FIXED, COMPOSITION 1/2 W, 300 OHMS, TYPE RCR20G301JS (+- 5 0/0) REF NO. 301-0301-00 REF NO. RCR20G301JS	EA	1	-	-	10	-	-
P-D-158	5905-104-8349	RESISTOR, FIXED, COMPOSITION 1/2 W, 510 OHMS, TYPE RCR20G511JS (+- 5 0/0) REF NO. RCR20G511JS	EA	1	-	-	10	-	-
P-D-159	5905-106-1274	RESISTOR, FIXED, COMPOSITION 1/2 W, 910 OHMS, TYPE RCR20G911JS (+- 5 0/0) REF NO. RCR20G911JS	EA	1	-	-	10	-	-
P-D-160	5905-110-0196	RESISTOR, FIXED, COMPOSITION 1/2 W, 1,000 OHMS, TYPE RCR20G102JS (+- 5 0/0) REF NO. RCR20G102JR REF NO. 8176288 REF NO. RCR20G102JS	EA	3	-	-	15	-	-
P-D-161	5905-111-4738	RESISTCR, FIXED, COMPOSITION 1/2 W, 1,500 OHMS, TYPE RCR20G152JS (+- 5 0/0) REF NO. RCR20G152JS	EA	1	-	-	10	-	-

FOR OFFICIAL USE ONLY

(1) SM & R CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEAS	(5) QUANTITY INCORPORATED IN UNIT	(6) 30 DAY MAINTENANCE ALLOWANCE (A) DIRECT SUPPORT MAINT	(6) 30 DAY MAINTENANCE ALLOWANCE (B) GENERAL SUPPORT MAINT	(7) DEPOT MAINT ALW PER 100 EQUIP	(8) ILLUSTRATION (A) FIGURE NUMBER	(8) ILLUSTRATION (B) ITEM NUMBER
P-D-162	5905-141-1168	RESISTOR, FIXED, COMPOSITION 1/2 W, 2,200 OHMS, TYPE RCR20G222JS (+- 5 C/O) REF NO. RCR20G222JS	EA	1	-	-	10	-	-
P-D-163	5905-111-4744	RESISTOR, FIXED, COMPOSITION 1/2 W, 5,100 OHMS, TYPE RCR20G512JS (+- 5 0/0) REF NO. 307-0057-00 REF NO. RCR20G512JS	EA	10	-	-	150	-	-
P-D-164	5905-141-1116	RESISTOR, FIXED COMPOSITION 1/2 W, 5,600 OHMS, TYPE RCR20G562JS (+ - 5 0/0) REF NO. RCR20G562JS	EA	1	-	-	20	-	-
P-D-165	5905-141-0591	RESISTOR, FIXED, COMPOSITION 1/2 W, 10,000 OHMS, TYPE RCR20G103JS (+- 5 0/0) REF NO. RCR20G103JS	EA	1	-	-	15	-	-
P-D-166	5905-111-4841	RESISTOR, FIXED, COMPOSITION 1/2 W, 13,000 OHMS, TYPE RCR20G133JS (+- 5 0/0) REF NO. RCR20G133JS	EA	2	-	-	10	-	-
P-D-167	5905-106-1273	RESISTOR, FIXED, COMPOSITION 1/2 W, 15,000 OHMS, TYPE RCR20G153JS (+- 5 0/0) REF NO. RCR20G153JS	EA	4	-	-	60	-	-
P-D-168	5905-106-1282	RESISTOR, FIXED, COMPOSITION 1/2 W, 22,000 OHMS, TYPE RCR20G223JS (+- 5 C/O) REF NO. RCR20G223JS	EA	1	-	-	10	-	-
P-D-169	5905-141-0599	RESISTOR, FIXED, COMPOSITION C 1/2 W, 39,000 OHMS, TYPE RCR20G393JS (+- 5 0/0) REF NO. RCR20G393JS	EA	1	-	-	10	-	-
P-D-170	5905-141-0597	RESISTOR, FIXED, COMPOSITION 1/2 W, 51,000 OHMS, TYPE RCR20G513JS (+- 5 0/0) REF NO. RCR20G513JS	EA	1	-	-	10	-	-
P-D-171	5905-106-9345	RESISTOR, FIXED, COMPOSITION 1/2 W, 68,000 OHMS, TYPE RCR20G683JS (+- 5 0/0) REF NO. RCR20G683JS	EA	1	-	-	10	-	-
P-D-172	5905-104-8331	RESISTOR, FIXED, COMPOSITION 1/2 W, 300,000 OHMS, TYPE RCR20G304JS (+- 5 0/0) REF NO. RCR20G304JS	EA	3			15	-	-
P-D-173	5905-111-4840	RESISTOR, FIXED, COMPOSITION 1/2 W, 510,000 OHMS, TYPE RCR20G514JS (+- 5 0/0) REF NO. RCR20G514JS	EA	1	-	-	10	-	-
P-D-174	5905-171-2000	RESISTOR, FIXED, COMPOSITION 1/2 W, 680,000 OHMS, TYPE RC20GF684J (+- 5 0/0) REF NO. MS35043-155 REF NO. 8531222 REF NO. EB6845 REF NO. EB6841 REF NO. RC20GF684J	EA	1	-	-	15	-	-

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FOR OFFICIAL USE ONLY

(1) SM & R CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION		(4) UNIT OF MEAS.	(5) QUANTITY INCORPORATED IN UNIT	(6) 30 DAY MAINTENANCE ALLOWANCE (A) DIRECT SUPPORT MAINT.	(6) (B) GENERAL SUPPORT MAINT.	(7) DEPOT MAINT. ALW. PER 100 EQUIP	(8) ILLUSTRATION (A) FIGURE NUMBER	(8) (B) ITEM NUMBER
	5905-104-5755	CONTINUED (U/O SER NO. 10,206 THRU 11,970.)								
P-D-243	5905-421-0623	RESISTOR, FIXED, COMPOSITION 1/2 W, 12 OHMS, TYPE RCR20G120JS (+- 5 C/O) REF NO. RCR20G120JS (U/O SER NO. 10,206 THRU 11,970.)	C	EA	3	-	-	35	-	-
P-D-244	5905-935-8540	RESISTOR, FIXED, COMPOSITION 1/2 W, 30 OHMS, TYPE RCR20G300JS (+- 5 0/0) REF NO. RCR20G300JS (U/O SER NO. 10,206 THRU 11,970.)		EA	1	-	-	10	-	-
P-D-245	5905-111-4734	RESISTCR, FIXED, CCMPOSITION 1/2 W, 47 OHMS, TYPE RCR20G470JS (+- 5 C/C) REF NO. RCR20G470JS		EA	8	-	-	80	-	-
P-D-246	5905-114-5361	RESISTOR, FIXED, COMPOSITION 1/2 W, 120 OHMS, TYPE RCR20G121JS (+- 5 0/0) REF NO. RCR20G121JS (U/O SER NO. 10,206 THRU 11,970.)	C	EA	2	-	-	25	-	-
P-D-247	5905-111-4736	RESISTCR, FIXED, COMPOSITION 1/2 W, 160 OHMS, TYPE RCR20G161JS (+- 5 C/C) REF NO. RCR20G161JS (U/O SER NO. 10,206 THRU 11,970.)	C	EA	1	-	-	10	-	-
P-D-248	5905-104-8349	RESISTOR, FIXED, COMPOSITION 1/2 W, 510 OHMS, TYPE RCR20G511JS (+- 5 0/3) REF NO. RCR20G511JS (U/O SER NO. 10,206 THRU 11,970.)	C	EA	1	-	-	15	-	-
P-D-249	5905-106-1274	RESISTOR, FIXEC, CCMPOSITION 1/2 W, 910 OHMS, TYPE RCR20G911JS (+- 5 0/0) REF NO. RCR20G911JS (U/O SER NO. 10,206 THRU 11,970.)	C	EA	1	-	-	15	-	-
P-D-250	5905-110-0196	RESISTOR, FIXED, COMPOSITION 1/2 W, 1,000 OHMS, TYPE RCR20G102JS (+- 5 0/0) REF NO. RCR20G102JR REF NO. 8176288 REF NO. RCR20G102JS (U/O SER NO. 10,206 THRU 11,970.)	C	EA	2	-	-	25	-	-
P-D-251	5905-111-4738	RESISTOR, FIXED, COMPOSITION 1/2 W, 1,500 OHMS, TYPE RCR20G152JS (+- 5 0/0) REF NO. RCR20G152JS (U/O SER NO. 10,206 THRU 11,970.)	C	EA	1	-	-	15	-	-
P-D-252	5905-141-0593	RESISTCR, FIXED, COMPOSITION 1/2 W, 1,800 OHMS, TYPE RCR20G182JS (+- 5 0/0) REF NO. RCR20G182JS (U/O SER NO. 10,206 THRU 11,970.)	C	EA	2	-	-	25	-	-
P-D-253	5905-935-8539	RESISTCR, FIXED, COMPOSITION 1/2 W, 2,000 OHMS, TYPE RCR20G202JS (+- 5 0/0) REF NO. RCR20G202JS (U/O SER NO. 10,206 THRU 11,970.)	C	EA	1	-	-	15	-	-

FOR OFFICIAL USE ONLY

(1) SM & R CODE	(2) FEDERAL STOCK NUMBER	DESCRIPTION	UNIT OF MEAS.	QUANTITY INCORPORATED IN UNIT	30 DAY MAINTENANCE ALLOWANCE (A) DIRECT SUPPORT MAINT.	30 DAY MAINTENANCE ALLOWANCE (B) GENERAL SUPPORT MAINT.	DEPOT MAINT. ALW. PER 100 EQUIP	ILLUSTRATION (A) FIGURE NUMBER	ILLUSTRATION (B) ITEM NUMBER
P-D-254	5905-141-1130	RESISTOR, FIXED, COMPOSITION 1/2 W. 2,700 OHMS, TYPE RCR20G272JS (+- 5 0/0) REF NO. EB2721 REF NO. RCR20G272JS (U/O SER NO. 10,206 THRU 11,970.) C	EA	1	-	-	15	-	-
P-D-255	5905-111-4744	RESISTOR, FIXED, COMPOSITION 1/2 W, 5,100 OHMS, TYPE RCR20G512JS (+- 5 0/0) REF NO. 307-0057-00 REF NO. RCR20G512JS (U/O SER NO. 10,206 THRU 11,970.) C	EA	2	-	-	25	-	-
P-D-256	5905-141-1116	RESISTOR, FIXED COMPOSITION 1/2 W, 5,600 OHMS, TYPE RCR20G562JS (+ - 5 0/0) REF NO. RCR20G562JS (U/O SER NO. 10,206 THRU 11,970.) C	EA	2	-	-	25	-	-
P-D-257	5905-116-8568	RESISTOR, FIXED, COMPOSITION 1/2 W, 7,500 OHMS, TYPE RCR20G752JS (+- 5 0/0) REF NO. RCR20G752JS (U/O SER NO. 10,206 THRU 11,970.) C	EA	1	-	-	15	-	-
P-D-258	5905-141-0591	RESISTOR, FIXED, COMPOSITION 1/2 W. 10,000 OHMS, TYPE RCR20G103JS (+- 5 0/0) REF NO. RCR20G103JS	EA	5	-	-	50	-	-
P-D-259	5905-106-1273	RESISTOR, FIXED, COMPOSITION 1/2 W, 15,000 OHMS, TYPE RCR20G153JS (+- 5 0/0) REF NO. RCR20G153JS	EA	1	-	-	15	-	-
P-D-260	5905-104-8330	RESISTOR, FIXED, COMPOSITION 1/2 W, 33,000 OHMS, TYPE RCR20G333JS (+- 5 0/0) REF NO. RCR20G333JS (U/O SER NO. 10,206 THRU 11,970.) C	EA	2	-	-	25	-	-
P-D-261	5905-141-0596	RESISTOR, FIXED, COMPOSITION 1/2 W, 47,000 OHMS, TYPE RCR20G473JS (+- 5 0/0) REF NO. RCR20G473JS (U/O SER NO. 10,206 THRU 11,970.) C	EA	2	-	-	25	-	-
P-D-262	5905-114-5441	RESISTOR, FIXED, COMPOSITION 1/2 W. 56,000 OHMS, TYPE RCR20G563JS (+- 5 0/0) REF NO. EB5631 REF NO. RCR20G563JS (U/O SER NO. 10,206 THRU 11,970.) C	EA	1	-	-	15	-	-
P-D-263	5905-104-8336	RESISTOR, FIXED, COMPOSITION 1/2 W, 100,000 OHMS, TYPE RCR20G104JS (+- 5 0/0) REF NO. RCR20G104JS	EA	2	-	-	25	-	-
P-D-264	5905-104-8331	RESISTOR, FIXED, COMPOSITION 1/2 W, 300,000 OHMS, TYPE RCR20G304JS (+- 5 0/0) REF NO. RCR20G304JS (U/O SER NO. 10,206 THRU 11,970.) C	EA	3	-	-	35	-	-
P-D-265	5905-141-1071	RESISTOR, FIXED, COMPOSITION 1/2 W, 470,000 OHMS, TYPE RCR20G474JS (+- 5 0/0) REF NO. RCR20GF474J REF NO. RCR20G474JS	EA	1	-	-	15	-	-

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(1) SM & R CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEAS.	(5) QUANTITY INCORPORATED IN UNIT	(6) 30 DAY MAINTENANCE ALLOWANCE (A) DIRECT SUPPORT MAINT.	(6) (B) GENERAL SUPPORT MAINT.	(7) DEPOT MAINT. ALW. PER 100 EQUIP	(8) ILLUSTRATION (A) FIGURE NUMBER	(8) (B) ITEM NUMBER
		REPAIR PARTS FOR MAJOR ITEMS							
		MISSILE GUIDANCE SET, AN/DPW-18 (9017423) OR AN/DPW-18A (9149099) OR AN/DPW-2 (10666975)							
P-O-1	1420-083-8249	ABSORBER, RADIO FREQUENCY RADIATION 1-9/16 W, 1-5/8 H, 2-15/16 LG REF NO. 9991584	EA	1	*	*	*	-	-
P-D-2	1420-769-6169	ACCELEROMETER, GUIDED MISSILE REF NO. 9010143 (U/O SER NO. 13,001 AND SUBQ.) C	EA	2	-	-	8	-	-
P-D-3	4935-800-6101	ADAPTER S, ZN-PLTD W/CHROMATE FIN., 0.032 THK, 13/32 H, 1/2 LG, CONCAVE SHAPE AT TOP REF NO. 8006101 (U/O SER NO. 13,106 AND SUBQ.) C	EA	2	-	-	10	-	-
P-D-4	8040-887-5857	ADHESIVE 3 PARTS OF THERMOSETTING LIQUID RESIN AND TWO PARTS OF POLYAMID RESIN, TWO TO THREE HRS POT LIFE, AIR CURE IN SIX TO EIGHT HRS, 1 QT CN REF NO. 9141496	QT	1	-	-	10	-	-
P-D-5	8040-887-1450	ADHESIVE POLYMERIZED ACRYLIC RESIN BASE, CLEAR LIQUID, HEAT AND CHEMICAL RESISTANT, USED W/SOLVENT (TOLUOL) 40 O/O SOLIDS, 1 GL CN REF NO. 8607093	PT	AR	-	-	1	-	-
P-D-6	8040-290-4301	ADHESIVE SYN-RU, LIQUID FORM, 1 QT CN REF NO. 8162031 REF NO. MILA5092TYPE2	QT	1	-	-	10	-	-
P-OT 7	1420-056-6975	AMPLIFIER, DECODER REF NO. 9989896	EA	1	1	*	2	-	-
P-O-8	1420-712-2939	AMPLIFIER, ELECTRONIC CONTROL REF NO. 9012373 (U/O SER NO. 13,001 AND SUBQ.) C	EA	1	1	*	2	-	-
P-O-9	1420-703-7776	AMPLIFIER, ELECTRONIC CONTROL REF NO. 10666546 (U/O SER NO. 13,001 AND SUBQ. AFTER MWO 9-1410-250-20/16 IS APPLIED, REPLACES FSN 1420-712-2940, REF NO. 9012378.) N	EA	2	1	*	4	-	-
P-F-11	1430-768-0154	ARM, LEVER REF NO. 9141421 (U/O SER NO. 13,001 AND SUBQ.) C	EA	2	*	*	20	-	-
P-D-12	1420-975-8524	BLOCK, MOUNTED REF NO. 9017480 (U/O SER NO. 13,001 AND SUBQ.) C	EA	1	-	-	10	-	-
P-F-13	5340-132-3257	BRACKET, ANGLE REF NO. 9144523	EA	1	*	*	4	-	-

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APPENDIX E – STANDARD BUILDING DRAWINGS

Upon deactivation and sale subsequent to the DoD ownership and use of the Nike sites, the site-specific "as-builts" drawings were typically left with the new owner. The drawings in this appendix represent those standard operational buildings. Select drawings used in the report are those that show sewer locations, heating and fuel tanks, transformers and operational equipment locations that need to be consider in environmental investigations. The drawings included are a good representation of those available from the US Army Corps of Engineers Office of History.

Following list of drawings are available at the Office of History.

CORRIDORS
Box 22
26-24-02, Sheets 1-6 -- interconnecting, modified emergency construction, special AAA, between radar control vans, engine generator, and frequency changer building, for control area
26-24-03, Sheets 1-14 -- interconnecting, with FUIF room, modified emergency construction, special AAA, between radar control vans, engine generator, and frequency changer building
26-24-04, Sheet 1 -- interconnecting, AN/FSG-1 tactical facilities

FREQUENCY CHANGER BUILDINGS
Box 22
DEF-26-24-07, Sheets 1-3 -- modified emergency construction, special AAA, modifications to existing building, NIKE-AJAX sites

GENERATOR BUILDINGS
Box 21
ME-26-03-33, Sheets 1,3 -- NIKE-1[23], battery launching area
ME-26-03-34, Sheets 1,3 -- NIKE-1, battery control area
ME-26-03-35, Sheet 3 -- NIKE-1, battery launching area
ME-26-03-38, Sheet 3 -- NIKE-1, battery launching area
ME-26-03-40, Sheets 1-4 -- battery-launching area, special AAA
Box 22
26-03-45, Sheets 1-3 -- modified emergency construction, special AAA
DEF-26-24-08, Sheets 1-12 -- NIKE-Hercules, tactical power improvement, control area
Box 76
40-01-29, Sheet 1 -- modified emergency construction, installation of mufflers on roof

[23] Nike 1 is used on the drawings but is equal to Nike Ajax.

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HEADQUARTERS AND HEADQUARTERS BATTERY BUILDINGS
Box 32
DEF-30-07-21, Sheets 1-6 -- Army Air Defense Program, modified emergency construction, attached to Nike Hercules firing battery

HIPAR BUILDINGS
Box 22
26-27-01, Sheets 1-22A -- non-consolidated and consolidated, modified emergency construction, improved NIKE-Hercules system

LATRINES - MISSILE AREA
Box 65
ME-38-03-16, Sheets 1-3 -- launching area, NIKE-1
ME-38-03-17, Sheets 1-3 -- battalion assembly area, NIKE-1
ME-38-03-18, Sheets 1-3 -- control area, NIKE-1
ME-38-03-19, Sheets 1-2 -- control area, NIKE-1
ME-38-03-20, Sheets 1-3 -- control area, NIKE-1
ME-38-03-21, Sheet 1 -- pit, launching area, NIKE-1
ME-38-03-22, Sheet 1 -- launching area, NIKE-1
ME-38-03-23, Sheet 1 -- pit, launching area, NIKE-1

MISSILES - ELECTRICAL DISTRIBUTION SYSTEMS
Box 82
ME-71-03-08, Sheets 1-2 -- special AAA, battery control area
71-03-12, Sheets 2, 4 -- special AAA, battery launching area, type D
ME-71-03-15, Sheets 1-2 -- special AAA, battery launching area, type F
ME-71-03-16, Sheets 1-3 -- special AAA, battery launching area, type G
71-03-17, Sheets 1-2 -- modified emergency construction, special AAA, battery control area
71-03-18, Sheet 2 -- modified emergency construction, special AAA, battery control area, alternate layout
71-03-19, Sheet 1 -- modified emergency construction, special AAA, battery launching area, type F
71-03-20, Sheets 1-2 -- modified emergency construction, special AAA, battery launching area, type G
71-03-21, Sheets 1-2 -- modified emergency construction, special AAA, HQ & HQ battery
71-03-56, Sheet 1 -- special AAA, battery launching area, type L
71-03-63, Sheet 1 -- Army Air Defense Program, modified emergency construction, battery control area - HERCULES

MISSILES - GENERAL (also see Latrines, Platforms)
Box 49
33-03-17, Sheets 1-6 -- interim cellular above ground launcher-prototype, special AAA, NIKE-AJAX and NIKE-HERCULES, White Sands Proving Ground, NM
33-03-17, Sheets 1-9 -- interim cellular above ground launcher-prototype, special AAA, NIKE-AJAX and NIKE-HERCULES
Box 51
AW-33-37-09, Sheets 1-54 -- operational facility
AW-33-37-09, Sheets 1-56 -- T/M launching facility
AW-33-37-10, Sheets 1-81 -- T/M operational facility, 8 cells
ME-33-38-01, Sheets 1-4 -- NIKE-1, warhead installation building
33-38-03, Sheets 1-4 -- modified emergency construction, warheading building
Box 52
SK-35-01-35, Sheet 1 -- guided missile assembly facility
Box 54
35-53-34, Sheets 1-18 -- modified emergency construction, special AAA, field maintenance shop, NIKE
SK-35-53-38, Sheets 1-2 -- combined field maintenance shop, NIKE, one battalion
SK-35-53-39, Sheets 1-2 -- combined field maintenance shop, NIKE, two battalions
SK-35-53-40, Sheets 1-2 -- combined field maintenance shop, NIKE, three battalions
SK-35-53-41, Sheets 1-2 -- combined (forward support) field maintenance shop, one to three battalions
SK-35-53-42, Sheets 1-2 -- combined field maintenance shop, HAWK, one battalion
SK-35-53-43, Sheets 1-2 -- combined field maintenance shop, NIKE and HAWK, one battalion
ME-35-60-04, Sheets 1-11 -- assembly and test building, NIKE-1
ME-35-60-05, Sheets 1-4 -- joining building, NIKE-1
ME-35-60-08, Sheets 1-4 -- special AAA, assembly and test building
35-60-16, Sheets 3-4 -- modified emergency construction, special AAA, assembly and test building
35-60-29, Sheets 1-6 -- modified emergency construction, Army Air Defense Program, assembly and test building
Box 76
40-02-88, Sheet 1 -- modified emergency construction, special AAA, minimum pad for AJAX launcher
40-02-93, Sheet 1 -- Army Air Defense Program, spreader beam for monorail hoist in NIKE warheading building
Box 79
60-02-62, Sheets 1-5 -- Army Air Defense Program, modified emergency construction, launcher section , control center
Box 164
16-06-299, Sheet 2 -- improved NIKE-HERCULES system, typical layout diagram, control area

MISSILES - NIKE

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(special section listed separately)
Box 162
12-20-40 -- cold storage facility
PRE-35-35-06, Sheets 1-3 -- technical operations building
S-109, Sheets 1-19 -- FY 59 composite structures
C-SK-202-1 -- 45 kw motor generator set
SK-2888, Sheets 1-4 -- industrial enginator unit (also in box 166 with sheet 5 added)
D-10572-53 -- firefighting equipment
D-10791, Sheets 1-2 -- hatch cover counterbalance
D-10791A -- escape hatch latch
D-11434-1 - 16 -- crane, acquisition radar tower, mounted
D-11523-1 - 3 -- buffer type pedestal
D-11584, Sheets 1-5 - D-11584-1A - 5 -- tracking radar tower
NE-20620, Sheet 1 -- field modification of safety check valve
NE-30422, Sheet 1 -- controller system
NE-40363, Sheet 1 & NE-40366, Sheet 1 -- power unit controllers
134741, Sheet 1 -- wiring diagram, control panel
9156145, Sheet 1 -- junction box
9976123, Sheets 1-4 -- circuit breaker meter assembly (sheet 1missing
9976222, Sheets 1-2 -- switch box
9976282, Sheets 1-4, 9986300, Sheets 1-4, & 9986301, Sheets1-5 -- circuit breaker meter assemblies
13200E1151, Sheets 1-13 -- support, radome
13200E1401, Sheets 2-3 -- crane, portable floor
13200E1461, Sheets 1-8 -- extension support, radome
13201E6401, Sheet 1 -- valve, combination rate of flow controller & automatic fuel shutoff
13201E6404, Sheet 1 -- gage, liquid valve
13201E6409, Sheet 1 -- bolt, swing
13201E6413, Sheet 1 -- canister, single cartridge, assembly
13201E6419, Sheet 1 -- pin, locating
13201E6422, Sheet 1 – skid
13201E6426, Sheet 1 -- body, canister
13201E6427, Sheet 1 -- plate, seal
13201E6432, Sheet 1 -- adapter, flanged
13201E6434, Sheet 1 -- cover, head
13201E6444, Sheet 1 -- spider
13201E6446, Sheet 1 -- canister assembly, double cartridge (also in box 166)
PL13201E6446, Sheets 1-2 -- canister assembly, double cartridge
13201E6447, Sheet 1 -- retainer
13201E6448, Sheet 1 -- support, valve
13201E6449, Sheet 1 -- adapter, flanged

Box 163
13201E6450, Sheets 1-2 -- filter/separator (also in box 166)

DL13201E6450, Sheets 1-6 -- filter/separator
PL13201E6450, Sheets 1-6 -- filter/separator
13201E6451, Sheets 1-3 -- body, vessel
13201E6470, Sheet 1 -- plate, seal, intermediate
13207E1096, Sheet 1 -- filter element
13207E7810, Sheet 1 -- lug
13207E7811, Sheet 1 -- eccentric
13207E7812, Sheet 1 -- valve, automatic water drain
13208E9126, Sheets 1-4 -- filter/separator
DL13208E9126, Sheets 1-7 -- filter/separator
PL13208E9126, Sheets 1-6 -- filter/separator
13208E9127, Sheets 1-5 -- body, vessel
13208E9128, Sheet 1 -- indicator, differential pressure Plates 1-5 -- Saturn Facilities Study Elbow

PLATFORMS - GENERAL (also see Towers - Water)
Box 60
ME-36-40-16, Sheet 1 -- J.P. fueling, NIKE-1
ME-36-40-17, Sheet 1 -- acid fueling, NIKE-1
36-40-27, Sheet 1 -- Army Air Defense Program, for FUIF shelter

TOWERS - GENERAL
(also see Tactical Facilities & Fortifications)
Box 53
ME-35-03-01, Sheets 1-2 -- radar, NIKE-1
35-03-02, Sheet 1 -- modified emergency construction, special AAA, acquisition radar
35-03-03, Sheets 1-2 -- modified emergency construction, special AAA, tracking radar
35-03-47, Sheets 1-3 -- modified emergency construction, Army Air Defense Program, acquisition radar
35-03-48, Sheets 1-4 -- modified emergency construction, Army Air Defense Program, tracking radar
35-03-49, Sheets 1-2 -- modified emergency construction, Army Air Defense Program, acquisition radar (existing)
35-03-50, Sheets 1-3 -- modified emergency construction, Army Air Defense Program, tracking radar (existing)
35-03-51, Sheets 1-6 -- modified emergency construction, Army Air Defense Program, ground mounts with radomes, acquisition radar
35-03-52, Sheets 1-6 -- modified emergency construction, Army Air Defense Program, ground mounts with radomes, tracking radar
35-03-53, Sheets 1-4 -- modified emergency construction, Army Air Defense Program, ground mounts with radomes, acquisition radar (existing)
35-03-54, Sheets 1-6 -- modified emergency construction, Army Air Defense Program, ground mounts with radomes, tracking radar (existing)
35-03-55, Sheets 1-2 -- modified emergency construction, Army Air Defense Program,

acquisition radar supports, modified for radome
35-03-56, Sheets 1-11 -- modified emergency construction, Army Air Defense Program, high power acquisition radar for improved NIKE-HERCULES system
35-03-57, Sheets 1-5 -- modified emergency construction, Army Air Defense Program, with radomes, alternate battery acquisition radar

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APPENDIX F – NIKE FUDS SITES

Appendix F
Nike Missile Battery Control and Launch Areas by Air Defense Area.[24]

FUDSMIS Property Number	FUDSMIS Property Name	Defense Area	Designation	Ajax	Hercules	Hercules Radars	Location	County	State
F10AK0850	Nike Site Bay	Anchorage	Bay		*	HIPAR	NW Anchorage, Goose Bay		AK
F10AK0579	Nike Alaska Point	Anchorage	Point		*	HIPAR	SW Anchorage		AK
		Anchorage	Summit		*	HIPAR	Anchorage/ Chugach Moutains		AK
C03MD0073	Nike Ba-03 (Phoenix)	Baltimore	BA-03	*	*	HIPAR	Phoenix/ Sweet Air	Baltimore	MD
C03MD0234	Nike Ba-09 (Fork)	Baltimore	BA-09	*			Fork	Baltimore	MD
		Baltimore	BA-18	*	*	ABAR/75, SMFU	Edgewood Arsenal		MD
C03MD0237	Nike Ba-30/31 (Tolchester)	Baltimore	BA-30/31	*	*	HIPAR	Chestertown	Kent	MD
C03MD0240	Nike Ba-43 (Fort Smallwood)	Baltimore	BA-43	*			Anne Arundel Co	Anne Arundel	MD
C03MD0244	Nike Ba-79 / W-05 (Granite)	Baltimore	BA-79	*	*	ABAR/75, AN/FPA-16	Granite	Baltimore	MD
C03MD0246	Nike Ba-92 (Towson)	Baltimore	BA-92	*			Cronhardt	Baltimore	MD
A06LA0037	Barksdale AFB - Nike BD-10	Barksdale	BD-10		*	HIPAR	Bellevue	Bossier	LA
A06LA0036	Barksdale AFB - Nike BD 50	Barksdale	BD-50		*	HIPAR	Stonewall	De Soto	LA
K06TX0996	Nike BG-40	Bergstrom	BG-40		*	HIPAR	Elroy	Bastrop	TX
		Bergstrom	BG-80		*	HIPAR	Austin		TX
D01MA006	Nike BO-03	Boston	BO-03	*			Reading	Middlesex	MA

[24] Note: This list represents all known operational batteries, most of which are FUDS. The Fort Bliss training sites are not listed, nor are the temporary above ground Ajax sites.

Appendix F
Nike Missile Battery Control and Launch Areas by Air Defense Area.[24]

FUDSMIS Property Number	FUDSMIS Property Name	Defense Area	Designation	Ajax	Hercules	Hercules Radars	Location	County	State
4									
D01MA0065	Nike BO-05	Boston	BO-05	*	*	HIPAR, SMFU, RRIS	Danvers	Essex	MA
D01MA0066	Nike BO-15	Boston	BO-15	*			Beverly	Essex	MA
D01MA0067	Nahant Nike 17	Boston	BO-17	*			Nahant	Essex	MA
		Boston	BO-36	*	*	HIPAR	Weymouth		MA
D01MA0069	Nike BO-37	Boston	BO-37	*			Quincy	Norfolk	MA
		Boston	BO-38	*			Hingham		MA
D01MA0039	Nike Bat BO-55	Boston	BO-55	*			Blue Hills		MA
D01MA0071	Nike 63	Boston	BO-63	*			Needham	Norfolk	MA
D01MA0072	Nike Bat BO-73	Boston	BO-73	*	*	ABAR/71, FPA-16	Lincoln	Middlesex	MA
D01MA0073	Nike BO-84	Boston	BO-84	*			Burlington	Middlesex	MA
		Boston	BO-85	*			Bedford		MA
D01CT0024	Nike 04	Bridgeport	BR-04	*	*	ABAR/71	Ansonia	New Haven	CT
		Bridgeport	BR-15	*			New Haven		CT
		Bridgeport	BR-17	*			Bridgeport		CT
D01CT0054	Nike Br-65	Bridgeport	BR-65	*			Bridgeport	Fairfield	CT
D01CT0055	Nike Br-23	Bridgeport	BR-73	*			Westport	Fairfield	CT
		Bridgeport	BR-94	*			Monroe		CT
C02NY0091	Nike BU 09	Buffalo	BU-09	*			Amherst	Erie	NY
C02NY0076	Nike BU 18	Buffalo	BU-18	*	*	ABAR/71	Lancaster	Erie	NY
C02NY0077	Nike BU 34/35	Buffalo	BU-34/35	*			Aurora	Erie	NY
C02NY0079	Nike BU 51/52	Buffalo	BU-52	*			Hamburg	Erie	NY
E05IL0035	Nike C-03 - Belmont HarBOr	Chicago-Gary	C-03	*	*	ABAR/75	Chicago	Cook	IL
		Chicago-Gary	C-32	*	*	HIPAR, SMFU	Porter/Chesterton		IN

Appendix F
Nike Missile Battery Control and Launch Areas by Air Defense Area.[24]

FUDSMIS Property Number	FUDSMIS Property Name	Defense Area	Designation	Ajax	Hercules	Hercules Radars	Location	County	State
E05IL0005	Nike C-40 - Burnham Park	Chicago-Gary	C-40	*			Burnham Park	Cook	IL
E05IL3258	Nike C-41 - Jackson Park	Chicago-Gary	C-41	*	*	ABAR/71	Jackson Park	Cook	IL
E05IL0204	Nike C-44 - Wolf Lake	Chicago-Gary	C-44	*			Hegewisch/Wolf Lake	Cook	IL
G05IN0986	Nike C-45, Gary Airport	Chicago-Gary	C-45	*			Gary	Lake	IN
G05IN0990	Nike Site C-46, Munster, Indiana	Chicago-Gary	C-46	*	*	ABAR/75	Munster	Lake	IN
G05IN0093	Nike Site 47	Chicago-Gary	C-47	*	*	HIPAR	Hobart	Porter	IN
G05IN0092	Nike Site C-48	Chicago-Gary	C-48	*			Gary	Lake	IN
E05IL0071	Nike C-49 - Homewood	Chicago-Gary	C-49/50	*	*	HIPAR	Homewood	Cook	IL
E05IL0072	Nike C-51 - Alsip	Chicago-Gary	C-51	*			Worth/Palos Heights/ La Grange	Cook	IL
E05IL0073	Nike C-54 - Orland Park	Chicago-Gary	C-54	*			Orland Park	Cook	IL
E05IL0074	Nike C-61 - Argonne Labs	Chicago-Gary	C-61	*	*	ABAR/75	Lemont	Du Page	IL
E05IL0027	Nike C-70 - Naperville	Chicago-Gary	C-70	*			Naperville	Du Page	IL
E05IL0075	Nike C-72 - Addison	Chicago-Gary	C-72	*	*	HIPAR	Addison	Du Page	IL
		Chicago-Gary	C-80				Arlington		IL
E05IL0076	Nike C-80/81 - Arlington	Chicago-Gary	C-80/81	*			Arlington Hts.	Cook	IL
E05IL0077	Nike C-84 - Palatine	Chicago-Gary	C-84	*			Palatine	Lake	IL
E05IL0078	Nike C-92/94 - Libertyville	Chicago-Gary	C-92/94	*			Libertyville	Lake	IL
E05IL0079	Nike C-93 - Skokie Lagoons	Chicago-Gary	C-93	*	*	HIPAR	Northfield	Cook	IL
E05IL0080	Nike C-98 - Fort Sheridan	Chicago-Gary	C-98	*			Fort Sheridan	Lake	IL

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Appendix F
Nike Missile Battery Control and Launch Areas by Air Defense Area.[24]

FUDSMIS Property Number	FUDSMIS Property Name	Defense Area	Designation	Ajax	Hercules	Hercules Radars	Location	County	State
G05OH0044	Nike Site CD-27	Cincinnati-Dayton	CD-27		*	ABAR/69	Wilmington	Clinton	OH
G05OH0045	Nike Battery 46	Cincinnati-Dayton	CD-46		*	HIPAR	Clermont Co	Clermont	OH
		Cincinnati-Dayton	CD-63		*	ABAR/75	Dearborn		IN
G05OH0046	Nike Site CD-78	Cincinnati-Dayton	CD-78		*	HIPAR, SMFU	Oxford	Butler	OH
G05OH0048	Nike #CL-02	Cleveland	CL-02	*	*	ABAR/75	Bratenahl/Cleveland	Cuyahoga	OH
G05OH0049	Nike CL-11	Cleveland	CL-11	*	*	HIPAR, RRIS	Painesvile	Lake	OH
G05OH0050	Nike CL-13	Cleveland	CL-13	*			Eastlake/Willowick	Lake	OH
G05OH0051	Nike Site CL-34	Cleveland	CL-34	*			Warrensville/ Highland Hills	Cuyahoga	OH
G05OH0052	Nike CL-48	Cleveland	CL-48	*			Independence/Garfield Heights	Cuyahoga	OH
G05OH0053	Nike Site Launch Site 59	Cleveland	CL-59	*			Parma	Cuyahoga	OH
G05OH0054	Nike Site Cl-67	Cleveland	CL-67	*			Cleveland Burke Lakefront Airport	Cuyahoga	OH
G05OH0047	Nike #Cl-69	Cleveland	CL-69	*	*	HIPAR	Fairview Park	Cuyahoga	OH
A04MS0031	Columbus Nike C-60	Columbus	Surveyed only				Columbus	Lowndes	MS
K06TX0265	Denton Nike (Dfw Nike Bat 1)	Dallas-Ft Worth	DF-01		*	HIPAR	Denton	Denton	TX
K06TX0264	Da-Ft Wor Def Nike Bat 20	Dallas-Ft Worth	DF-20		*	ABAR/71, AN/FPA-16	Terrell	Kaufman	TX
K06TX0263	Da-Ft Wor Def Nike Bat 50	Dallas-Ft Worth	DF-50		*	HIPAR	Alvarado	Johnson	TX
		Dallas-Ft Worth	DF-70		*	ABAR/71, AN/FPA-16	Ft Walters		TX

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Appendix F
Nike Missile Battery Control and Launch Areas by Air Defense Area.[24]

FUDSMIS Property Number	FUDSMIS Property Name	Defense Area	Designation	Ajax	Hercules	Hercules Radars	Location	County	State
E05MI0121	Nike Site D-06	Detroit	D-06	*	*	ABAR/69 & 75, AN/FPA-15	Utica	Macomb	MI
E05MI0122	Nike D-14-16	Detroit	D-14	*			Selfridge AFB	Macomb	MI
		Detroit	D-16	*	*	HIPAR	Selfridge AFB		MI
E05MI0189	Usarc & Nike D-17l	Detroit	D-17	*			Algonac/ Marine City	St Clair	MI
E05MI0125	Nike D-23-26	Detroit	D-23	*			Detroit City/ Kercheval	Wayne	MI
		Detroit	D-26	*	*	ABAR/71	Ft Wayne/ Detroit		MI
E05MI0123	Nike D-51	Detroit	D-51	*			NAS Gross Isle	Wayne	MI
E05MI0115	Nike D-54-55	Detroit	D-54	*			Riverview/ Wyandotte	Wayne	MI
E05MI0116	Nike D57/58, Newport	Detroit	D-57	*			Carleton	Monroe	MI
E05MI0116	Nike D57/58, Newport	Detroit	D-58	*	*	HIPAR	Carleton/ Newport NAS	Monroe	MI
E05MI0124	Nike D-61	Detroit	D-61	*	*	ABAR/75	Romulus/ Dearborn	Wayne	MI
		Detroit	D-69	*			River Rouge Park/ Detroit	Wayne	MI
		Detroit	D-86	*			Franklin/ Bingham	Wayne	MI
E05MI0119	Nike D-87	Detroit	D-87	*	*	HIPAR	Commercial/ Union Lake	Oakland	MI
		Detroit	D-97	*			Auburn Hts		MI
K06TX0056	Dyess AFB-Nike Dy10	Dyess	DY-10		*	HIPAR	Fort Phantom Hill/ Abilene	Taylor	TX
K06TX0169	Nike Battery Dy-50	Dyess	DY-50		*		Camp Berkeley/ Abilene	Johnson	TX
B08SD0340	Ellsworth AFB Nike Battery E-01	Ellsworth	E-01	*	*	HIPAR	Ellsworth AFB	Meade	SD
B08SD0338	Ellsworth AFB Nike Battery E-20	Ellsworth	E-20	*			Ellsworth AFB	Meade	SD

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FUDSMIS Property Number	FUDSMIS Property Name	Defense Area	Designation	Ajax	Hercules	Hercules Radars	Location	County	State
B08SD0339	Ellsworth AFB Nike Battery E-40	Ellsworth	E-40	*			Ellsworth AFB	Pennington	SD
B08SD0341	Ellsworth AFB Nike Battery E-70	Ellsworth	E-70	*			Ellsworth AFB	Meade	SD
F10AK0853	Nike Site Jig	Fairbanks	Jig		*	HIPAR	Fairbanks, Se. Of		AK
F10AK0854	Nike Site Love	Fairbanks	Love		*	HIPAR	Fairbanks, N. Of		AK
		Fairbanks	Mike		*	HIPAR	Eielson AFB		AK
		Fairbanks	Peter		*	HIPAR	Eielson AFB		AK
		Fairbanks	Tare		*	HIPAR	Newman		AK
F10AK1006	Eielson Nike	Fairbanks						Aleutians East	AK
F10WA0303	Fairchild Defense Area Nike 07	Fairchild	F-07	*			Spokane	Spokane	WA
		Fairchild	F-37	*			Cheney		WA
F10WA0305	Fairchild Defense Area Nike 45	Fairchild	F-45	*	*	HIPAR	Medical Lake	Spokane	WA
		Fairchild	F-87		*		Deep Creek		WA
		Hanford	H-06	*	*		Saddle Mt.		WA
		Hanford	H-12	*			Othello		WA
		Hanford	H-52	*			Rattlesnake Mtn		WA
		Hanford	H-83	*			Priest Rapids		WA
D01CT0025	Nike 08	Hartford	HA-08	*	*	HIPAR	East Windsor	Hartford	CT
D01CT0056	Nike Ha-25	Hartford	HA-25	*			Manchester	Hartford	CT
		Hartford	HA-36	*			Portland		CT
D01CT0058	Nike 48	Hartford	HA-48	*	*	HIPAR	Cromwell	Middlesex	CT
D01CT0059	Nike Ha-67	Hartford	HA-67	*			Plainville	Hartford	CT
		Hartford	HA-85	*			Avon/ Simsbury		CT

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FUDSMIS Property Number	FUDSMIS Property Name	Defense Area	Designation	Ajax	Hercules	Hercules Radars	Location	County	State
		Homestead - Miami	HM-03		*	ABAR/75, SMFU	Opa Locka		FL
		Homestead - Miami	HM-40		*	HIPAR	Key Largo		FL
		Homestead - Miami	HM-66		*	HIPAR	Florida City		FL
I04FL0003	Everglades (Nike HM-69)	Homestead - Miami	HM-69		*	Mobile HIPAR, ABAR/75	Florida City	Dade	FL
		Homestead - Miami	HM-95		*	ABAR/75	Southwest Miami		FL
B07MO0149	KCDA Nike Battery 10	Kansas City	KC-10		*	HIPAR	Lawson	Ray	MO
B07MO0002	KCDA Nike Battery 30	Kansas City	KC-30		*	ABAR/75	Pleasant Hill	Cass	MO
B07KS0150	KCDA Nike Battery 60	Kansas City	KC-60		*	HIPAR	Gardner	Johnson	KS
B07KS0990	KCDA Nike 80-Radar Area	Kansas City	KC-80		*	ABAR/75	Fort Leavenworth	Leavenworth	KS
B07NE0075	Lincoln AFB Nike Battery Li-01	Lincoln	LI-01		*		Ceresco/ Davey	Lancaster	NE
B07NE0001	Lincoln AFB Nike Battery Li-50 (Control)	Lincoln	LI-50		*		Crete	Lancaster	NE
D01ME0028	Nike LO-13	Loring	L-13	*	*		Caswell	Aroostook	ME
D01ME0076	Nike L-31	Loring	L-31	*			Limestone	Aroostook	ME
D01ME0077	Nike 58	Loring	L-58	*	*		Caribou	Aroostook	ME
D01ME0005	Nike LO-85	Loring	L-85	*			Conner	Aroostook	ME
		Los Angeles	LA-04	*	*	HIPAR	Mt. Gleason/ Palmdale		CA
		Los Angeles	LA-09	*			Barley Flats/ Mt. Disappointment		CA
J09CA0423	Nike Battery 14 - Silos	Los Angeles	LA-14	*			South El Monte	Los Angeles	CA
J09CA7057	Former Nike Site La-14, Launcher Area	Los Angeles	LA-14	*			South El Monte	Los Angeles	CA

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FUDSMIS Property Number	FUDSMIS Property Name	Defense Area	Designation	Ajax	Hercules	Hercules Radars	Location	County	State
J09CA0420	Nike Battery 29	Los Angeles	LA-29	*	*	HIPAR, ABAR/71, AN/FPA-16	Brea/ Puente Hills	Los Angeles	CA
J09CA0424	La Def Area Nike Batt 32	Los Angeles	LA-32	*	*	HIPAR	Garden Grove	Los Angeles	CA
J09CA0421	La Def Area Nike Bat40	Los Angeles	LA-40	*			Long Beach Airport/ Lakewood	Los Angeles	CA
		Los Angeles	LA-43	*	*	HIPAR	Ft. MacArthur/ White Point		CA
J09CA0155	Nike Battery 55-Point Vicente	Los Angeles	LA-55	*	*	ABAR/71, AN/FPS-7, AN/FPA-16	Point Vicente	Los Angeles	CA
J09CA0418	Nike Battery #57	Los Angeles	LA-57	*			Torrance/Redondo Beach	Los Angeles	CA
J09CA0419	Nike Bty 70	Los Angeles	LA-70	*			El Segundo/ Hyperion	Los Angeles	CA
		Los Angeles	LA-73	*			Playa Del Rey		CA
J09CA0004	Saddle Peak Nike	Los Angeles	LA-78	*	*	HIPAR	Malibu	Los Angeles	CA
J09CA0417	La Def Area Nike 88	Los Angeles	LA-88	*	*	HIPAR	Chatsworth/ Oak Mtn.	Los Angeles	CA
J09CA0162	Nike 94 Mca Housing Site	Los Angeles	LA-94	*	*	ABAR/75	Los Pinetos/ Newhall	Los Angeles	CA
J09CA0422	La Def Area Nike Btry 96	Los Angeles	LA-96	*	*	HIPAR, ABAR/75, AN/FPS-78	Van Nuys/ Sepulveda	Los Angeles	CA
		Los Angeles	LA-98	*			Magic Mtn/ Lang/ Saugus		CA
E05WI2065	Nike Site M-02	Milwaukee	M-02	*	*	HIPAR	River Hills	Milwaukee	WI
E05WI0067	Nike M-20/Lake Park Grounds	Milwaukee	M-20	*	*	LOPAR	Milwaukee	Milwaukee	WI
E05WI1067	Nike Site M-42	Milwaukee	M-42	*			Cudahy	Milwaukee	WI
E05WI2067	Nike Site M-54	Milwaukee	M-54	*			Hales Corners/ Paynesville	Milwaukee	WI

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FUDSMIS Property Number	FUDSMIS Property Name	Defense Area	Designation	Ajax	Hercules	Hercules Radars	Location	County	State
E05WI3067	Nike Site M-64	Milwaukee	M-64	*			Muskegon/ Prospect	Milwaukee	WI
E05WI4067	Nike Site M-74	Milwaukee	M-74	*	*	HIPAR, RRIS	Waukesha	Milwaukee	WI
E05WI5067	Nike Site M-86	Milwaukee	M-86	*			Menominee Falls	Milwaukee	WI
E05WI1065	Nike M-96/ Havenwoods Nature Preserve	Milwaukee	M-96	*			Milwaukee	Milwaukee	WI
E05WI0065	Nike Site MSP-20	Minneapolis	MS-20		*	ABAR/75	Roberts	St Croix	MN
E05MN0040	Nike Site Battery MSP-40	Minneapolis	MS-40		*	ABAR/71	Farmington	Dakota	MN
E05MN0070	Nike Site MSP #70	Minneapolis	MS-70		*	HIPAR	St Bonifacius	Hennepin	MN
E05MN0225	Nike Msp-90/Mn. Sheriffs Boy's Ranch	Minneapolis	MS-90		*	HIPAR	Bethel	Isanti	MN
C02NY0065	Nike NY 04/05	New York	NY-03/04	*	*	HIPAR	Orangeburg/ Mount Nebo	Rockland	NY
C02NY0094	Nike NY 09	New York	NY-09	*			Kenisco/ White Plains	Westchester	NY
C02NY0018	Nike Bat NY 15 Launch	New York	NY-15	*			Ft. Slocum	Bronx	NY
C02NY0068	Nike NY 20	New York	NY-20	*			Lloyd Harbor/ Huntington	Suffolk	NY
C02NY0089	Nike NY 23	New York	NY-23	*			Hicksville/ Oyster Bay	Nassau	NY
C02NY0069	Nike NY 24	New York	NY-24	*	*	HIPAR	Amityville/ Farmington	Suffolk	NY
C02NY0066	Nike NY-25 Con Area	New York	NY-25	*	*	HIPAR, SMFU, RRIS	Rocky Point/ Brookhaven	Suffolk	NY
C02NY0090	Nike NY 29/30	New York	NY-29/30	*			Lido Beach	Nassau	NY
		New York	NY-49	*	*	2 HIPARs, SMFU	Ft Tilden/ Rockaway Point Road		NY

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C02NJ0798	Nike Bat #53	New York	NY-53	*			Leonardo/ Belford	Monmouth	NJ
C02NJ0051	Nike NY 54	New York	NY-54	*	*	HIPAR	Holmdel/ Hazlet	Monmouth	NJ
		New York	NY-56	*	*	2 HIPARs, ABAR/75, DCL	Ft. Hancock		NY
C02NJ0046	Nike NY-60	New York	NY-58/60	*	*	ABAR/75	South Amboy	Middlesex	NJ
C02NJ0050	Nike NY 65	New York	NY-65	*	*	ABAR/75	South Plainfield	Middlesex	NJ
C02NJ0056	Nike NY-73	New York	NY-73	*			Summit/ Watchung	Union	NJ
C02NJ0037	Nike Bat NY 80	New York	NY-80	*	*	HIPAR	Livinngston/ Essex Falls/ East Hannover	Hudson	NJ
C02NJ0058	Nike NY 88	New York	NY-88	*			Mt. View	Passaic	NJ
C02NJ0054	Nike NY 93/94	New York	NY-93/94	*	*	ABAR/71 AN/FPA-16	Ramsey/ Darlington/ Mahwah	Bergen	NJ
C02NJ0060	Nike Bat 93 (See Nike NY 93/94)	New York	NY-93/94				Mahwah	Bergen	NJ
C02NY0067	Nike NY 99	New York	NY-99	*			Spring Valley/ Ramapo	Rockland	NY
C02NY0022	Nike Missile Base	New York					Harriman	Orange	NY
C02NY0074	Nike NF 03	Niagara	NF-03	*			Model City	Niagara	NY
C02NY0093	Nike Bat NF16	Niagara	NF-16	*	*	HIPAR	Sanborn/ Cambria	Niagara	NY
C02NY0078	Nike NF-41	Niagara	NF-41	*	*	HIPAR	Grand Island	Erie	NY
		Niagara	NF-74	*			Grand Island	Erie	NY
		Niagara	NF-75	*			Grand Island	Erie	NY
C03VA0130	Nike N-02	Norfolk	N-02	*			Fox Hill	Hampton	VA
		Norfolk	N-20	*			Ocean View	Hampton	VA
		Norfolk	N-25	*	*	HIPAR, SMFU, RRIS	Ft Story		VA

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FUDSMIS Property Number	FUDSMIS Property Name	Defense Area	Designation	Ajax	Hercules	Hercules Radars	Location	County	State
C03VA0131	Nike N-36	Norfolk	N-36	*			Kempsville	Virginia Beach	VA
		Norfolk	N-52	*	*	HIPAR	Deep Creek/ Portsmouth		VA
C03VA0033	Nike Site N-63	Norfolk	N-63	*			Nansemond/ Suffolk	Suffolk	VA
		Norfolk	N-75	*			Smithfield/ Carrollton		VA
		Norfolk	N-85	*	*	ABAR/69, ABAR/75, AN/FPA-15	Denhigh/ Patrick Henry/ Camp Patrick/ Newport News Airport		VA
		Norfolk	N-93	*			Hampton/ Spiegelville		VA
D01MA0027	Nike Headquarters, Ma	Norfolk					Quincy	Norfolk	MA
	Site 2	Oahu	OA-17		*		Kaukai/ Kahuhu	Honolulu	HI
H09HI0453/ H09HI0455	Nike Site No. 3/ Nike Site No. 4	Oahu	OA-32		*		Bellows AFS/ Waimanalo	Honolulu	HI
H09HI0456/ H09HI0457	Nike Site No. 5/ Nike Site No. 6	Oahu	OA-63		*		Ewa/ Makakilo	Honolulu	HI
H09HI0452	Nike Site No. 1	Oahu	OA-84		*		Waialua/ Dillingham	Honolulu	HI
B07IA0420	Offutt AFB Nike Battery OF-10	Offutt	OF-10			HIPAR	Council Bluffs	Pottawattamie	IA
B07IA0430	Offutt AFB Nike Battery OF-10 (Launcher)	Offutt	OF-10		*		Council Bluffs	Pottawattamie	IA
B07NE0002	Offutt AFB Nike Battery OF-60 (Launcher)	Offutt	OF-60		*		Cedar Creek	Cass	NE

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FUDSMIS Property Number	FUDSMIS Property Name	Defense Area	Designation	Ajax	Hercules	Hercules Radars	Location	County	State
B07NE0082	Offutt AFB Nike Battery OF-60 (Control)	Offutt	OF-60			HIPAR	Cedar Creek	Cass	NE
C03PA0072	Nike PH-07 (Richboro)	Phildelphia	PH-07	*			Richboro	Bucks	PA
C03PA0228	Nike PH-15 (Bristol)	Phildelphia	PH-15	*			Newportville/ Corydon	Bucks	PA
C02NJ0063	Nike Bat #23-25	Phildelphia	PH-23/25	*	*	HIPAR, ABAR/75, AN/FPS-78	Lumberton	Burlington	NJ
C02NJ0055	Nike PH 32	Phildelphia	PH-32	*			Marlton	Passaic	NJ
C02NJ0053	Nike PH 41/43	Phildelphia	PH-41/43	*	*	2 HIPARs, SMFU, RRIS, DCL	Berlin/ Clementon	Gloucester	NJ
C02NJ0064	Nike PH 49	Phildelphia	PH-49	*			Pittman	Gloucester	NJ
C02NJ0044	Nike PH 58	Phildelphia	PH-58	*	*	ABAR/75	Swedesboro	Gloucester	NJ
C03PA0229	Nike PH-67 (Chester)	Phildelphia	PH-67	*			Chester/ Village Green/ Media	Delaware	PA
C03PA0230	Nike PH-75/78 (Media)	Phildelphia	PH-75	*	*	ABAR/69, RRIS	Edgemont/ Delaware City	Chester	PA
		Phildelphia	PH-82	*			Paoli/ Valley Forge		PA
C03PA0232	Nike PH-91 (Worcester)	Phildelphia	PH-91	*			Worcester/ Center Square	Montgomery	PA
C03PA0233	Nike PH-97/99 (Lansdale)	Phildelphia	PH-99	*	*	HIPAR	Warrington/ Eureka	Bucks	PA
C03PA1082	Nike PH-66 (Philadelphia)	Phildelphia					Philadelphia	Philadelphia	PA
C03PA0070	Nike PI-02 (Rural Ridge)	Pittsburgh	PI-02	*			Rural Ridge	Allegheny	PA
C03PA0221	Nike PI-03 (Dorseyville)	Pittsburgh	PI-03	*	*	HIPAR	Dorseyville/ Indianola	Allegheny	PA
C03PA1045	Nike PI-25 (Plum BOrough)	Pittsburgh	PI-25	*			Murrysville/ Monroe	Allegheny	PA

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C03PA0222	Nike PI-36 (North Huntingdon)	Pittsburgh	PI-36	*	*	ABAR/75	Irwin	Westmoreland	PA
C03PA0223	Nike PI-37 (Rillton)	Pittsburgh	PI-37	*	*	HIPAR, SMFU	Cowansburg/ Herminie	Westmoreland	PA
C03PA1047	Nike PI-42 (Elizabeth Twp)	Pittsburgh	PI-42	*			Elizabeth	Allegheny	PA
		Pittsburgh	PI-43	*	*	ABAR/71, AN/FPA-16	Elrama		PA
C03PA1046	Nike PI-52 (Finleyville)	Pittsburgh	PI-52	*			Finleyville	Washington	PA
C03PA1048	Nike PI-62 (Oakdale)	Pittsburgh	PI-62	*			Bridgeville/ Hickman	Allegheny	PA
C03PA0225	Nike PI-71 (Coraopolis)	Pittsburgh	PI-71	*	*	HIPAR	Coraopolis/ Beacon	Allegheny	PA
		Pittsburgh	PI-92	*			Bryant/ North Park		PA
		Pittsburgh	PI-93	*	*	ABAR/71, AN/FPA-16	Westview		PA
D01MA0013	Nike PR-19	Providence	PR-19	*			Rehoboth	Bristol	MA
D01MA0075	Nike 29	Providence	PR-29	*			Swansea	Bristol	MA
D01RI0061	Bristol Nike 38	Providence	PR-38	*	*	HIPAR	Bristol	Bristol	RI
D01RI0062	Nike Control PR-58	Providence	PR-58	*			North Kingston	Washington	RI
D01RI0017	Nike PR-69	Providence	PR-69	*			Coventry	Kent	RI
D01RI0063	Nike PR-79	Providence	PR-79	*			Foster Center/ Foster	Providence	RI
		Providence	PR-99	*	*	ABAR/71, AN/FPA-16	North Smithfield/ Woonsocket		RI
I04GA0576	Nike Bat28,Rob AFB Def	Robbins	R-28	*			Jeffersonville	Twiggs	GA
I04GA0385	Nike 88	Robbins	R-88	*			Byron	Peach	GA

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E05IL0081	Nike SL-10 - Marine	Saint Louis	SL-10		*	ABAR/71, AN/FPA-16	Marine	Madison	IL
E05IL0082	Nike SL-40 - Hecker	Saint Louis	SL-40		*	HIPAR	Hecker	Monroe	IL
B07MO0986	Nike Hercules SL-60	Saint Louis	SL-60		*	ABAR/71, AN/FPA-16	Pacific	Jefferson	MO
E05IL0203	Nike SL-90 - Grafton	Saint Louis	SL-90		*	HIPAR	Alton/ Pere Marquette	Jersey	IL
		San Francisco	SF-08	*			San Pablo Ridge		CA
		San Francisco	SF-09	*			Berkeley/ San Pablo Ridge		CA
J09CA0937	SF Nike 25	San Francisco	SF-25	*			Rocky Ridge	Contra Costa	CA
J09CA1103	San Francisco Nike 31	San Francisco	SF-31	*	*	HIPAR	Lake Chabot/ Castro Valley	Alameda	CA
		San Francisco	SF-37	*			Newark/Coyote Hills		CA
J09CA3115	SF Nike 51 (SweeNY Ridge)	San Francisco	SF-51			HIPAR	Milagra	Marin	CA
J09CA7077	SF Nike 51, Malagra Ridge	San Francisco	SF-51	*	*		Milagra	San Mateo	CA
J09CA0941	SF Nike Batt 59	San Francisco	SF-59	*			Ft Funston/ Mt San Bruno	San Francisco	CA
		San Francisco	SF-87	*	*	ABAR/75	Ft. Cronkhite/ Sausalito		CA
		San Francisco	SF-88	*	*	HIPAR	Ft. Barry/ Sausalito		CA
J09CA0943	SF Nike Batt 91	San Francisco	SF-91	*			Angel Island	Marin	CA
J09CA0944	SF Nike Batt 93	San Francisco	SF-93	*	*	ABAR/71 AN/FPA-16	San Rafael	Marin	CA
		Seattle	S-03	*			Kenmore		WA
F10WA0092	Redmond Nike 13-14	Seattle	S-13	*	*	ABAR/75, SMFU	Redmond	King	WA

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F10WA0013	Cougar Mt. Nike 20	Seattle	S-20	*			Cougar Mtn/ Issaquah	King	WA
F10WA0090	Youngs Lake Nike 32-33	Seattle	S-32	*			Lake Youngs	King	WA
		Seattle	S-33	*			Lake Youngs/ Renton		WA
F10WA0515	Nike Midway 43	Seattle	S-43	*			Kent/ Midway	King	WA
F10WA0094	Vashon Nike 61	Seattle	S-61	*	*	HIPAR	Vashon Island	King	WA
F10WA0089	Olalla Nike 62	Seattle	S-62	*			Ollala	Kitsap	WA
F10WA0037	PoulsBO Nike 81	Seattle	S-81	*			Poulsbo	Kitsap	WA
F10WA0088	Winslow Nike 82	Seattle	S-82	*			Winslow/ Bainbridge Island	Kitsap	WA
F10WA0087	Kingston Nike 92	Seattle	S-92	*	*	HIPAR	Kingston	Kitsap	WA
J09CA0974	Tra AFB Nike 10	Travis	T-10	*	*	HIPAR, SMFU	Elmira	Solano	CA
J09CA0975	Tra AFB Nike 33	Travis	T-33	*			Dixon/ Lambie	Solano	CA
J09CA0976	Tra AFB Nike 53	Travis	T-53	*			Potrero Hillls	Solano	CA
J09CA0977	Tra AFB Nike 86	Travis	T-86	*	*	ABAR/75	Fairchild/ Cement Hills	Solano	CA
		Turner	TU-28		*		Willingsham/ Sylvester		GA
I04GA0399	Turner AFB Nike Bat#79	Turner	TU-79		*		Armenal/ Sasser	Lee	GA
K06NM0504	WAFB Def Ar Nike Bat Wa10	Walker	WA-10		(not operated)		Walker AFB	Chaves	NM
K06NM0505	WAFB Def Ar Nike Bat Wa50	Walker	WA-50		(not operated)		Walker AFB	Chaves	NM
C03MD0235	Nike W-25 (Davidsonville)	Washington	W-25	*	*	HIPAR	Davidsonville	Anne Arundel	MD

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C03MD0236	Nike W-26 (Annapolis)	Washington	W-26	*	*	ABAR/75	Annapolis/ Skidmore/ Bay Bridge	Anne Arundel	MD
C03MD0239	Nike W-35 (Croom)	Washington	W-35		*		Croom/ Marlboro	Prince George's	MD
C03MD0238	Nike W-36 (Croom)	Washington	W-36		*		Brandywine/ Naylor	Prince George's	MD
C03MD0241	Nike W-44 (Waldorf)	Washington	W-44	*	*	ABAR/71, AN/FPA-16	Mattawoman/ Waldorf/ La Plata	Charles	MD
C03MD0242	Nike W-45 (Laplata)	Washington	W-45		*		Waldorf	Charles	MD
C03MD0243	Nike W-54 (Pomonkey)	Washington	W-54		*		Pomonkey	Charles	MD
		Washington	W-64	*	*	HIPAR	Lorton		VA
C03VA0249	Nike W-Ba-74	Washington	W-74		*		Fairfax/ Pohick	Fairfax	VA
C03VA0003	Carrollton Nike Park	Washington	W-75				Isle Of Wight Co	Isle Of Wight	VA
		Washington	W-83		*		Herndon/ Dranesville		VA
C03MD0245	Nike W-92 (Rockville)	Washington	W-92	*	*	HIPAR	Rockville	Montgomery	MD
C03MD0247	Nike W-93 (Olney)	Washington	W-93		*		Laytonville/ Deerwood	Montgomery	MD
C03MD1019	Nike W-93 (Laytonsville)	Washington	W-94		*		Gaithersburg	Montgomery	MD

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APPENDIX G - RESEARCHING NIKE MISSILE BATTERIES

Nike Program

The Nike air defense program deployed the Nike-Ajax and the Nike-Hercules missiles inside the Continental United States. The steps below, obtained from http://www.army.mil/cmh-pg/faq/nike.htm , provides a quick overview of one approach to locating Nike program records.

- Determine the originating agency for the records you need and how those records were preserved and retired.
- “Research and development records normally were retired in a regular process by the various agencies and subordinate staff elements, and requests for information from or access to those records” may need to be addressed through the Freedom of Information and Privacy Act Division.
- Contact successor agency history offices to determine whether any compiled monographic studies or assembled background historical files.

Redstone Arsenal has historical monograph on both Nike Ajax and Nike Hercules systems: *Historical Monograph Development, Production, And Deployment Of The Nike Ajax Guided Missile System 1945 - 1959* by Mary T. Cagle available at http://www.redstone.army.mil/history/pdf/welcome.html or, *History Of The Nike Hercules Weapons System*, Mary T. Cagle available at http://ed-thelen.org/h_mono-1.html .

“To Defend and Deter: The Legacy of the United States Cold War Missile Program” by John C. Lonnquest, 1996 and David F. Winkler provides an overview of the Nike systems and contains a listing of the Nike sites by defense area, missile, launcher and magazine type, and date of operations. See http://www.cevp.com or http://www.cevp.com/docs/COLDWAR/1996-11-01952.pdf

Last Line of Defense, Nike Missile Sites in Illinois, Christine Whitacre, Editor for National Park Service, 1996 contains a description and drawings of the various buildings. Also see http://www.cevp.com or http://www.cevp.com/docs/COLDWAR/1996-01-02135.pdf

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Battery and Unit Histories

Records of individual missile batteries are more difficult because the records themselves have been split into several locations.

- Procurement and construction records of individual sites normally were withdrawn from other Army record holdings, and now are normally housed in either the Engineer District Offices of the US Army Corps of Engineers, or in the responsible regional site of the National Archives and Records Administration (the regional archives division of the nearest Federal Records Center). We suggest that the first step in attempting to locate those materials should be to contact the archivist at the Historical Office of the US Army Corps of Engineers.
- Both the Regular Army and the Army National Guard contained NIKE units. The first step in searching for unit records should be to determine if the unit in question belonged to the Army National Guard; if so, then the records probably are still in the custody of the individual state's Adjutant General. Most NIKE unit records created by the Regular Army, and possibly some Army National Guard ones, should have been sent to the Military Operational Archives, National Personal Records Center, 9700 Page Boulevard, St. Louis, Missouri 63132. That agency has indicated that records which can be identified contain correspondence, charts, plans, architectural drawings, but are not consistent in content. If records are not at St. Louis, contact the Freedom of Information Act and Privacy Division.

Source: http://www.army.mil/cmh-pg/faq/nike.htm

The Modern Military Records, Textual Archives Services Division of National Archives at College Park advised that "unit histories and supporting documents for Army units….. after 1954, …., if they still exist, remain in the custody of the Department of the Army." They advised contacting FOIA/Privacy Act Office, 7798 Cissna Road, Suite 205, Springfield, VA 22150-3197.

Operating Unit Number by Battery

Rings of Supersonic Steel, Air Defenses of the United States Army 1950-1979 - an introductory history and site guide, 2nd Edition, 2002 by Mark A. Berhow and Mark L. Morgan is one source that identifies the individual batteries by battalion and artillery regiment number as well as the operational period of each missile battery.

People:
People that have served on individual batteries can provide useful information. The http://ed-thelen.org/ contains a link to personnel at http://ed-thelen.org/ppl.html which can be useful to locate persons for interviews. Information on ordnance support units can be found at http://www.zianet.com/dpiland/ordnance/UnitedStates.htm .

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Websites

The following are a few worldwide websites that contain information on the Nike missile programs, operations, units, and other information. This by no means a comprehensive list but reflects websites reviewed in preparing this report.

- http://www.goerigk-jever.de/doing.html#operations
- http://alpha.fdu.edu/~bender/nike.html
- http://ed-thelen.org/ (Note this site contains many links to other Nike related sites.)
- http://ed-thelen.org/research.html provides additional sources of potential interest when researching Nike sites.
- http://ed-thelen.org/Nike-SiteswithTerraServerImages.html contains links to TerraServer images which show the sites in current conditions.
- http://www.zianet.com/dpiland/ordnance/ also contains many links to Nike related sites.

Engineer Pamphlet

EP 870-1-64, *Guides to Environmental Research*, Environmental Cleanup at Former and Current Military Sites: *A Guide to Research*, Nov 2001, by Michael W. Harper, Thomas R. Reinhardt, and Barry R Sude should also be utilized to assist in develop a research approach to the missile battery history. See http://www.usace.army.mil/inet/usace-docs/eng-pamphlets/ep870-1-64/toc.htm

The NIKE Missile Site Investigation Program

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Annex I to §3.0 of the WP.

ABSTRACT

The U.S. Army's NIKE missile system was built to provide protection from aerial attack to major military installations as well as key metropolitan areas from approximately 1955 to 1975. During this period, 292 missile sites were operational in the continental United States. Operations at the sites required assembly, maintenance and storage of components of military hardware as well as handling, disposal and storage of fuels, cleaners, solvents, hydraulic fluids and other materials necessary to maintain a NIKE missile battery operation.

As with any use of military or industrial hardware, the generation of hazardous waste materials was a typical byproduct. Because of past waste management practices, the Army wished to determine if environmental degradation was occurring at these sites. To investigate this possibility, provisions of the 1984 Defense Appropriations Act were implemented to permit the Defense Department to include specific, formerly owned, NIKE s[illegible] for investigations.

[illegible]ne role of the Huntsville Division of the Corps of Engineers was that of central manager during the inventory phase of the DERP. Further studies, if required, would be the responsibility of HND for ordnance contaminated sites, and would be the responsibility of the Missouri River Division for hazardous and toxic contaminated sites.

This paper presents background information on the NIKE missile program, describes a typical site layout, presents general information about the site operations and briefly discusses some of the site-specific findings from 11 sites that have been investigated by Law Environmental Services. Data from nine of the 11 sites have been evaluated, and results indicate that little contamination was evident in the monitoring wells, soil and surface water samples associated with the sites.

INTRODUCTION

The Department of Defense (DOD) conducts a number of industrial processes and manufacturing operations that are similar to private industry. In the late 1970s, DOD became aware of the negative impacts of what previously were considered acceptable disposal practices of waste materials associated with these processes and operations. In response to that knowledge, programs were developed between 1975 and 1978 by each service component to identify and assess potential contamination on active military installations. Authority to address problems at formerly used DOD sites was lacking since funds could not be spent on sites not owned by DOD.

The passage of the 1984 Defense Appropriations Act corrected this situation. Specific language in the Act directed DOD to ex[illegible] its efforts to include sites formerly used by DOD and broaden the definition of "hazard" to include unsafe structures and debris which were to be abandoned or had been abandoned upon termination of their military use. The Act directed that the Secretary of Defense assume overall management of the program to assure a consistent approach and adequate resource allocation.

The objective of this investigation was to assess the potential for toxic or hazardous contamination related to all former NIKE missile sites located throughout the continental United States (CONUS). Contamination included hazardous or toxic substances found in the groundwater, surface water and soil, with contaminants specified by regulatory criteria. To fulfill this objective, a two-phase program was developed. Phase I involved a generic study of the NIKE program that included the following work elements:

- Review NIKE site listing forms
- Determine agencies involved with the NIKE battery
- Perform archive search to obtain technical manuals, training manuals, operating procedures and field manuals
- Meet with previous NIKE site operators
- Review USATHAMA reports to assist in documenting contaminant sources at NIKE installations
- Locate "As-Built" drawings
- Obtain generic and site specific deactivation plans
- Prepare a hazardous substance list
- Identify potential contamination sources
- Identify hazardous operational practices

Phase II of this investigation involved specific field investigations and analytical programs at selected NIKE sites across the United States. The following sections of this paper briefly describe the NIKE program background, typical operating units at NIKE sites, potential contamination source areas and potential contaminants at NIKE sites. Finally, the paper briefly discusses some of the site-specific findings from nine of the sites that were investigated.

NIKE PROGRAM BACKGROUND

NIKE Ajax and NIKE Hercules missiles were deployed by the United States Army throughout the continental United States to protect major metropolitan areas and strategic military installations from aerial attack. The NIKE system was generally operational from the early 1950s to the mid-1970s. Maintenance of the missile batteries in a combat-ready status required the storage, handling and disposal of missile components as well as solvents, fuels, hydraulic fluids, paints and other materials required for support functions.

During the period of its operational life, the NIKE Ajax system remained essentially unchanged. However, a second generation

ENCL. 3

NIKE system, NIKE Hercules, was under development by the mid-1950s. NIKE Ajax batteries were similar in design and construction with all units having similar operational components. Beginning in late 1958, selected NIKE Ajax batteries began conversion to the more advanced NIKE Hercules system. However, it was not until early 1964 that the last NIKE Ajax battery was deactivated and the entire operational system employed the NIKE Hercules missile. The primary role of the NIKE Hercules system was its ability to attack high-speed, high-flying aircraft formations with a single nuclear warhead. The NIKE Ajax system used liquid fuels which were highly toxic and had to be handled with extreme care. The NIKE Hercules missiles made more use of solid fuel which significantly simplified the fueling and maintenance operations of the missile system.

In 1962 the Army began transferring operation of certain NIKE batteries to National Guard units. Shortly thereafter, deactivation of NIKE batteries began. By 1970, the Army had deactivated more CONUS NIKE sites. National Guard units continued to maintain a few sites until the late 1970s. Some NIKE equipment is still retained in Ft. Bliss for training troops from other North Atlantic Treaty Organization (NATO) countries that still incorporate NIKE missiles in their defense programs.[1]

NIKE SYSTEM DESCRIPTION

A NIKE site typically consisted of two separate and distinct operating units. These units included the Launcher Area and the Integrated Fire Control (IFC) Area. The Launcher Area generally was located on approximately 40-60 acres, although each site could vary significantly in size and shape. The IFC Area generally ranged in size from 10-50 acres. The Barracks facilities were either incorporated as part of the Launcher Area or the IFC Area, or a third separate and distinct Family Housing Area was constructed. The Launcher Area and the IFC Area generally were located 1-2 miles apart to facilitate necessary distance and equipment restrictions that involved the successful interaction of the two areas.

The layout of structures within each area appears to have been site-specific, although different sites have many similar structures. Fig. 1 illustrates a generalized NIKE Launcher Area. For the Launcher Area, the key structural units include the missile assembly building, the warhead building and three magazine (missile storage)/launch units. Although not shown in the figure, the IFC Area generally included the radar units, a generator building, general storage and supply buildings and, in most cases, the motorpool. At some sites, the motorpool could have been located at the Launcher Area. These sites also generally included a number of waste disposal units including sump and draining systems, seepage pits, septic tanks with infiltration wells for liquid waste disposal and occasionally on-site landfills.

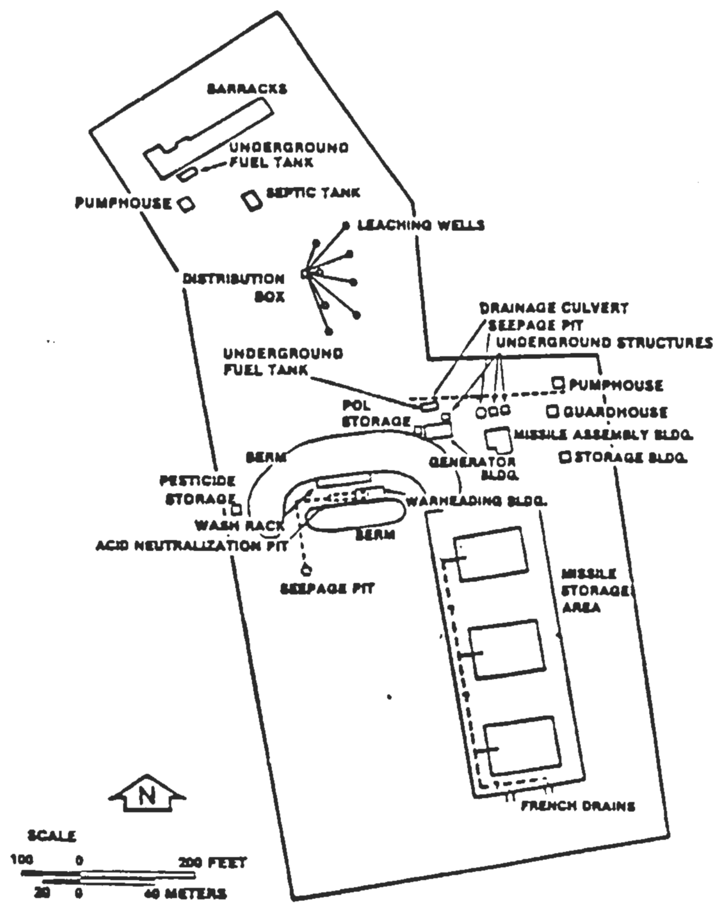

Figure 1
Typical Site Plan for a NIKE Launcher Area

GENERAL UNIT OPERATIONS

The Launcher Area of a NIKE site was the location where the missiles and warheads were assembled, maintained and prepared for firing. The missiles arrived at the site disassembled as 13 specific components. All operations necessary to make the missile flight ready were then conducted in specific locations in the Launcher Area. In general, routine maintenance and checking procedures were performed on the missile at the Launcher Area.

The IFC Area at a site contained all the radar, guidance, electronic and communications equipment needed to identify incoming targets, launch missiles and direct missiles in flight.

POTENTIAL CONTAMINATION SOURCE AREAS

Because of the nature of site operations, several individual sources of potential contamination existed on former NIKE sites.[2-4] The generalized site diagram for the Launcher Area is intended to indicate the major structural units for reference to areas that could have resulted in waste. As previously stated, the location of these units on any given site varied with the terrain and the general arrangement of facilities.

Waste Fluid Disposal

Probably the most significant general practice that occurred that could have led to contamination was the method of dealing with waste fluids. Standard operating practices dictated that waste fluids were to be accumulated in POL (Petroleum, Oils, Lubricants) barrels which were periodically transported to disposal sites. However, waste fluids were reported to have been disposed of directly to the soil surface on occasion, rather than being placed in POL barrels, resulting in localized contamination. The POL barrel contents reportedly have been dumped occasionally in a random "unofficial" manner, both on-site and off-site. Locations of such dumps are predictable only by general site characteristics.

Missile Assembly Drainage and Seepage System

The missile assembly building operations involved the use of various solvents, anticorrosion products and paints as the missiles were assembled and disassembled. The building was equipped with a full-length drainage system. Spilled or waste materials could be washed or dumped into this drainage system.

Diesel and Fuel Oil Storage Tanks

A number of electric power generators reportedly were used on

NIKE sites, and diesel fuel storage was considerable. Tanks also were used to store fuel oil for heating purposes. These tanks were probably steel, but this could not be documented. It is probable that several tanks were present at each site, holding up to 5,000 gal each. Leakage from fueling and defueling operations and actual tank leakage undoubtedly occurred.

Magazine Sump Seepage Systems

Within the typical NIKE magazine, a floor drainage system permitted waste materials to be washed to a central sump located under the missile elevator shaft. This sump was equipped with a pump to deliver water and waste out of the magazine and into a seepage system. Solvents, paints and hydraulic fluid were supposedly washed to the sump on a routine basis.

Secluded Areas Adapted to "Unofficial" Dumping

Dumping of various wastes was reported as common at NIKE sites. The primary factor affecting the incidence of dumping was convenience. Certain authorized disposal routes were available to NIKE sites. However, utilization of these disposal routes varied from site to site. Solid waste could be delivered to municipal landfills while the Army POL service was responsible for removing waste solvents, oils and paints.

When the landfill was not convenient or the POL was irregular about pickup, other methods were used to dispose of the waste. Rural sites were particularly prone to "unofficial" dumping. Dumping reportedly occurred both on-site and off-site.[5-7]

Warheading/Fueling Area Drainage System

The potential for contamination in this area is considered to be less than that found in other areas. Liquid fuels rarely were spilled in quantities. The IRFNA (nitric acid), UDMH (dimethyl hydrazine) and ethylene oxide were hazardous, volatile materials and were handled very carefully. It was very rare that quantities of these materials escaped accidentally. In addition, due to the extreme reactivity of these substances, any spillage or leakage that may have resulted in contamination would not persist in the environment for any considerable length of time.

Battery electrolyte reportedly was discarded in this area, therefore modest amounts of lead may have been introduced as a result. However, it is likely that other sources of lead, such as paint, were of much greater magnitude. Sulfates and nitrates in the warheading/fueling area would be insignificant in the concentrations at which they would occur.

Septic Systems

When barracks were located on the Launcher Area, a septic system of significant size was required. Urban and suburban NIKE sites were connected to municipal wastewater systems. However, rural sites required a septic tank and leaching system. Barracks were more often sited at the IFC area, along with the battery administration and other facilities.

Integrated Fire Control (IFC) Area

The IFC Area was less prone to chemical contamination than the Launcher Area. The diversity of chemicals was smaller, and the primary mission of the IFC radar operation did not require significant chemical use. The main units of concern with regard to contamination at the IFC area were the following:

- Motor Pool
- Septic System
- Diesel, Fuel Oil and Gasoline Storage Tanks
- Secluded Areas Adapted to Unofficial Dumping

Site Deactivation

No site-specific deactivation plans were obtained. The primary information concerning deactivation practices came from the site operator interviews. Two generic deactivation plans[8,9] were reviewed; however, these plans did not address issues pertaining to chemicals or practices that may have involved contamination. Actual practice of deactivation probably resulted in disposal and/or abandonment of considerable volumes of potentially hazardous materials according to the site interviews. Specific practices varied significantly from site to site.

MASTER CONTAMINANTS LIST

Based on the analysis of site operations, a master list of possible NIKE site contaminants was prepared (Table 1). Each substance identified on the master list was used in significant quantities on NIKE sites and has a high probability of causing contamination if discharged to the environment. Most of the other materials identified in this investigation were eliminated from consideration since the volume of use on NIKE sites was small. Certain chemicals identified in previous investigations conducted by the United States Army Toxic and Hazardous Materials Agency (USATHAMA) were not included on the master list. The primary criteria for not including materials on the master list included:

- The materials were used only in small quantities
- The materials were used with extreme care such that only minor quantities might have been released
- The materials were reactive to the environment such that possible contamination from these materials would have dissipated with time

Specific discussions of the substances comprising the master list, and of certain significant materials that were eliminated from the list, are presented in the following section. Materials on the master list that represent additions relative to previous studies are so designated.

Table 1
Master List of Significant Potential NIKE Site Contaminants

MATERIAL	USE CHARACTERISTICS	DISPOSAL METHOD
Benzene	Solvent	Evaporation, Drainage and Leaching
	General Solvent and Fuel Constituent	Fuel Tank Leakage
Carbon Tetrachloride (Tetrachloromethane)	Solvent	Evaporation, Drainage and Leaching
Chromium (Chromates, Chrome III, IV, and VI)	Decorroding Missile Parts	Drainage and Leaching, Surface Disposal
Petroleum Hydrocarbons	Fuels, Lubricants, Hydrocarbons	Consumed, Fuel Tank Leakage, Spillage to Soil, POL Turn-in, Drainage and Leaching, Surface Disposal
Lead (Carbonates and Oxide)	Paints and Battery Electrolyte	Drainage and Leaching, POL Turn-in
Perchlorethylene (Tetrachloroethene)	Solvent	Evaporation, Drainage and Leaching
Toluene	Solvent Constituent of Fuels	Drainage and Leaching Fuel Tank Leakage
1,1,1-Trichloroethane	Solvent	Evaporation, Drainage and Leaching
1,1,2-Trichloroethane	Solvent	Evaporation, Drainage and Leaching
Trichloroethylene	Solvent	Evaporation, Drainage and Leaching

Benzene

Benzene was probably in use as a solvent in the early stages of the NIKE program but was eliminated from updated standard equipment inventories. It remained in the text of the unrevised portions of the TM 9-1400-250-15/3 operations manual. Benzene was removed from military use due to its toxicity.

Benzene is also a common constituent of other solvents and fuels. Gasoline, for example, contains significant amounts of benzene, so that NIKE site contamination from leaking fuel tanks or other solvent use increased the potential for benzene contamination.[10-12]

Carbon Tetrachloride

As indicated in studies of NIKE sites (USATHMA DRXTH-AS-IA-83016), carbon tetrachloride was used in the early portions of the NIKE program. It is a superior solvent and was used extensively for cleaning and degreasing.

Chromium

Chromium originates on NIKE sites in the cleaning materials chromium trioxide and sodium dichromate, as well as in zinc chromate and other paints.

Petroleum Hydrocarbons

Fuels, non-chlorinated solvents, naphthas, lubricants, paints and hydraulic fluid all fall into the class of petroleum hydrocarbons. Because there are thousands of different but similar hydrocarbons, they are considered as a group when dealing with contamination from the materials mentioned above. In sheer quantity, hydrocarbons constitute the most significant potential contaminant of former NIKE sites.

Lead

Lead originates on NIKE sites in battery electrolyte and lead-based paints. Paint disposal at NIKE sites may have caused extensive contamination by lead.

Perchlorethylene

Interviews confirmed the use of perchloroethylene on NIKE sites. It was used as a solvent, probably after carbon tetrachloride use ceased and before the introduction of trichloroethene and ichloroethanes. High-volume use could be expected during that period.

Toluene

Toluene was specified as a cleaning solvent for missile components. It is also a component of fuels and other solvents.

1,1,1-Trichloroethane, 1,1,2-Trichloroethane and Trichloroethene

The use of these solvents was documented previously by USATHMA and was confirmed by this investigation.

Other Materials Considered

The materials discussed in the following paragraphs are potential contaminants that were not placed on the master list of contaminants for the reasons previously discussed, but which warrant further discussion because they are mentioned in other source material as possible contaminants.

Unsymmetrical Dimethyl Hydrazine (UDMH)

UDMH was used in small amounts and stored for use in small sealed canisters. UDMH was carefully handled and controlled on NIKE sites. Spills very rarely occurred, and only intentional landfilling would present a contamination situation. In the environment, UDMH does not persist because of its reactivity. UDMH will not occur on NIKE sites, except in sealed canisters, and will not be found in water or soil samples.

Ethylene Oxide

Ethylene oxide was used throughout the NIKE program as a for the Accessory Power Supply (APS) system. This system burned ethylene oxide primarily to power missile guidance hydraulics. The system was tested periodically with a "hot run." Waste ethylene oxide was disposed of immediately by burning or dilution in water and on-site dumping.

Ethylene oxide is a reactive, volatile liquid stored at low temperatures. (It has a boiling point of 11°C.) In the environment, it decays in a very short time. No ethylene oxide remained as a NIKE site contaminant.

Aniline and Furfuryl Alcohol

These starter fuels were not used in large quantities and pose very little contamination hazard.

JP-4

JP-4 is a hydrocarbon fuel similar to kerosene. Contamination by JP-4 is considered along with other fuels under the hydrocarbon category.

Low-Level Radiation

Radiation resulting from electrical tube disposal caused extremely minute contamination with no associated hazard. Leakage from nuclear weapons did not occur according to knowledgeable sources.

IRFNA (Nitric Acid)

IRFNA was an extremely hazardous material that was handled with extreme caution by NIKE site operators. Very little contamination via spillage occurred. The small amounts that were spilled rapidly reacted to become nitrates. Nitrates occur naturally in soils and are very commonly used as fertilizer. There is little chance that serious contamination of NIKE sites occurred as a result of the use of IRFNA.

Polychlorinated Biphenyls (PCBs)

PCBs were present on NIKE sites in permanent, sealed electric transformers. Small, random leaks of transformers may have occurred during site operation and after deactivation. Contamination resulting from PCBs would be small, localized, unpredictable and unlikely to be discovered except from visual observation of a leaking transformer. Therefore, PCBs were not included in the master list for screening during the Preliminary Determination Phase.

Asbestos

Asbestos may still remain on some sites in its original form in buildings, on piping and ductwork. It could potentially be removed if demolition occurs at the site. Asbestos was not included on the master list for screening during the Preliminary Determination Phase Investigations.

PHASE II PROGRAM

Phase II of the investigation involved field and analytical projects at 11 specific sites across the United States. Selection of the sites was intended to provide a broad look at NIKE sites in distinct geographic regions. Current ownership and use and relevant environmental considerations were factored into the selection process. Table 2 provides a general description of nine of the 11 sites investigated, each site's general geographic region of the United States, a brief description of the site and contaminants observed at the site. The reports of the investigations are under review by the USA Corps of Engineers and other government agencies, so specific locations cannot be provided at this time.

Table 2
Phase II NIKE Sites

SITE DESIGNATION	GEOGRAPHIC REGION	GENERAL DESCRIPTION	CONTAMINANTS OBSERVED
1. Site 1	Southeast	Launcher Area – 23 ac., IFC Area – 8 ac., no underground silos, 3 above ground launch areas, used from 1959 to 1966, currently owned by county school system, slight contamination	Tetrachloroethylene (Perchloroethylene) in groundwater
2. Site 2	Northeast	Launcher Area – 18 ac., IFC Area – 9 ac., 3 underground silos, used from 1956 to 1967, currently owned by city school system, no DOD contamination evident.	No DOD contamination evident
3. Site 3	East	Launcher Area – 40 ac., IFC Area – 6 ac., 3 underground silos, used from 1955 to 1961, currently owned by county correction dept., slight contamination	Hydraulic fluid in missile silo
4. Site 4	Central	Launcher Area – 16 ac., IFC Area – 9 ac., 3 underground silos, used from 1959 to 1970, currently owned by state school system, contamination in ground water, surface water, soils	Trichloroethene; 1,1,1-trichloroethane; 1,2-dichloroethane; vinyl chloride; toluene; chloroform; ethyl benzene trans-1,2-dichloroethene
5. Site 5	South	Launcher Area – 26 ac., IFC Area – 11 ac., no underground silos, 3 aboveground launch areas, used from 1960 to 1966, currently owned by state school system no DOD contamination evident.	No DOD contamination evident.
6. Site 6	North	Launcher Area – 19 ac., IFC Area – 22 ac., 3 underground silos, used from 1955 to 1970, currently owned by city school system, slight contamination	Diesel fuel in soil near underground tank.
7. Site 7	Northwest	Launcher Area – 17 ac., IFC Area – 6 ac., 3 underground silos, used from 1960to 1966, currently owned by county correction dept., no DOD contamination evident.	No DOD contamination evident
8. Site 8	West	Launcher Area – 26 ac., IFC Area – 10 ac., 2 underground silos, used from 1953 to 1963, currently owned by U.S. COE, very slight contamination in ground water and soil, hydraulic fluid in silos.	Low levels of tetrachloroethene; 1,1-dichloroethane; 1,1,1-trichloroethane; hydraulic fluid.
9. Site 9	South	Launcher Area – 21 ac., IFC Area – 10 ac., no underground silos, 3 above ground launch areas; used from 1964 to 1970; currently owned by U.S. Parks Dept.; no DOD contamination evident.	No DOD contamination evident

A typical site investigation included the following work elements:

- Preliminary site visit
- Preparation of site-specific work plans
- Installation of groundwater monitoring wells
- Development of groundwater monitoring wells
- Sampling of groundwater monitoring wells, surface water and soils at the site
- Chemical and physical analysis of the water and soil samples
- Evaluation of the analytical data
- Preparation of engineering report, including a site hazard ranking system (HRS) report

The analytical program for each site included analysis for volatile organic compounds, hydrocarbons (diesel and gasoline), metals and nitrates. Results from the analyses were compared to applicable water quality standards and criteria and soil criteria to determine if contamination was present at the locations sampled.

Study Results

The following are generalized results and conclusions derived from the field investigation phase of the study:

- A general conclusion based on the 11 investigations would be that the majority of the NIKE sites most likely are not contaminating the environment except on a very localized basis. Contamination was only present at a few of the sites and generally at only a few of the sampling locations. Particular contamination discovered at the sites included volatile organic compounds near missile silos, diesel fuel near underground tanks and hydraulic fluid in missile silos.
- Contamination detected at the sites was located around operational structures such as the missile silos and near underground fuel tanks related to support units such as the generator building. However, the contamination appears to be related most often to inadequate or incomplete deactivation rather than operational practices. For example, an area near an underground tank showed visible surface contamination of diesel fuel. If the tank had been properly deactivated by filling, or removed during deactivation, the contamination probably would not have occurred. Likewise, hydraulic fluid was present in several missile silos, either floating on water present in the silos or in the silo sump. If the deactivation process had removed all the hydraulic fluid from the units, the contamination most likely would not have occurred.

From information developed in Phase I and Phase II of this investigation, it appears that contamination can occur at installations formerly used as NIKE batteries. However, contamination does not appear to be widespread at former NIKE sites and subsequent investigations should be centered around operational units such as the missile silos and at support units with underground fuel tanks. The most likely contaminants will include volatile organic compounds and hydrocarbons.

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12. U.S. Army, TM 9-1440-252-34, "DS and GS Maintenance of the Hercules Monorail Launcher, Launching-Handling Rail, Side Truss, Loading Rack Support, Launcher-Transport Modification Kit, Launcher-Subsurface Four-Rack Modification Kit, and Launcher Basis Accessory Kit," Aug. 1960.

Appendix E

Regulatory Database Search Reports

The EDR Radius Map
with GeoCheck®

Middletown USARC, CT
499 MILE LANE
MIDDLETOWN, CT 06457

Inquiry Number: 01714247.182r

July 13, 2006

EDR® Environmental Data Resources Inc

The Standard in Environmental Risk Management Information

440 Wheelers Farms Road
Milford, Connecticut 06461

Nationwide Customer Service

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Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-05) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

499 MILE LANE
MIDDLETOWN, CT 06457

COORDINATES

Latitude (North):	41.581900 - 41˚ 34' 54.8''
Longitude (West):	72.692600 - 72˚ 41' 33.4''
Universal Tranverse Mercator:	Zone 18
UTM X (Meters):	692350.7
UTM Y (Meters):	4605715.0
Elevation:	103 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	41072-E6 MIDDLETOWN, CT
Most Recent Revision:	1992

TARGET PROPERTY SEARCH RESULTS

The target property was identified in the following government records. For more information on this property see page 6 of the attached EDR Radius Map report:

Site	Database(s)	EPA ID
US ARMY RESERVE CENTER 499 MILE RD MIDDLETOWN, CT 06457	NY MANIFEST	N/A

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

FEDERAL RECORDS

NPL - National Priority List
Proposed NPL - Proposed National Priority List Sites
Delisted NPL - National Priority List Deletions

EXECUTIVE SUMMARY

NPL RECOVERY .... Federal Superfund Liens
CERCLIS .... Comprehensive Environmental Response, Compensation, and Liability Information System
CERC-NFRAP .... CERCLIS No Further Remedial Action Planned
CORRACTS .... Corrective Action Report
RCRA-TSDF .... Resource Conservation and Recovery Act Information
RCRA-LQG .... Resource Conservation and Recovery Act Information
RCRA-SQG .... Resource Conservation and Recovery Act Information
ERNS .... Emergency Response Notification System
HMIRS .... Hazardous Materials Information Reporting System
US ENG CONTROLS .... Engineering Controls Sites List
US INST CONTROL .... Sites with Institutional Controls
DOD .... Department of Defense Sites
FUDS .... Formerly Used Defense Sites
US BROWNFIELDS .... A Listing of Brownfields Sites
CONSENT .... Superfund (CERCLA) Consent Decrees
ROD .... Records Of Decision
UMTRA .... Uranium Mill Tailings Sites
ODI .... Open Dump Inventory
TRIS .... Toxic Chemical Release Inventory System
TSCA .... Toxic Substances Control Act
FTTS .... FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
SSTS .... Section 7 Tracking Systems
ICIS .... Integrated Compliance Information System
PADS .... PCB Activity Database System
MLTS .... Material Licensing Tracking System
MINES .... Mines Master Index File
FINDS .... Facility Index System/Facility Registry System
RAATS .... RCRA Administrative Action Tracking System

STATE AND LOCAL RECORDS

SDADB .... Site Discovery and Assessment Database
SWF/LF .... List of Landfills/Transfer Stations
SWRCY .... Recycling Facilities
LWDS .... Connecticut Leachate and Wastewater Discharge Sites
UST .... Underground Storage Tank Data
AST .... Marine Terminals and Tank Information
CT Spills .... Oil & Chemical Spill Database
AUL .... ELUR Sites
VCP .... Voluntary Remediation Sites
DRYCLEANERS .... Drycleaner Facilities
BROWNFIELDS .... Brownfields Inventory
ENF .... Enforcement Case Listing
CT PROPERTY .... Property Transfer Filings

TRIBAL RECORDS

INDIAN RESERV .... Indian Reservations
INDIAN LUST R1 .... Leaking Underground Storage Tanks on Indian Land
INDIAN UST R1 .... Underground Storage Tanks on Indian Land

EDR PROPRIETARY RECORDS

Manufactured Gas Plants .... EDR Proprietary Manufactured Gas Plants

EXECUTIVE SUMMARY

EDR Historical Auto Stations EDR Proprietary Historic Gas Stations
EDR Historical Cleaners EDR Proprietary Historic Dry Cleaners

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

STATE AND LOCAL RECORDS

SHWS: The State Hazardous Waste Sites records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. The data come from the Department of Environmental Protection's Inventory of Hazardous Disposal Sites.

A review of the SHWS list, as provided by EDR, and dated 05/19/2006 has revealed that there is 1 SHWS site within approximately 1 mile of the target property.

Lower Elevation	Address	Dist / Dir	Map ID	Page
J.J. VINCI COAL COMPANY	***1000 NEWFIELD STREET***	***1/2 - 1 ENE***	***3***	***12***

LUST: The Leaking Underground Storage Tank Incident Reports contain an inventory of reported leaking underground storage tank incidents. The data come from the Department of Environmental Protection's Leaking Underground Storage Tank List.

A review of the LUST list, as provided by EDR, and dated 05/23/2006 has revealed that there is 1 LUST site within approximately 0.5 miles of the target property.

Lower Elevation	Address	Dist / Dir	Map ID	Page
KASDEN ELM CITY	***397 MILE LANE***	***1/4 - 1/2 E***	***2***	***6***

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped:

Site Name	Database(s)
MIDDLETOWN TOWN GARAGE	CT MANIFEST
CITY OF MIDDLETOWN, MT. HIGBY RESE	CT MANIFEST
CONNECTICUT DEAPRTMENT OF TRANSPOR	CT MANIFEST
PHOENIX PRODUCTS COMPANY	CT MANIFEST
BISH ELECTRIC	CT MANIFEST
CT DEPT OF TRANSPORTATION	NY MANIFEST
ROUTE 72	SWF/LF
NEWFIELD STREET	SWF/LF, CT Spills
ARMY RESERVE CENTER	LUST
WADSWORTH FALLS STATE PARK	RCRA-SQG, FINDS

OVERVIEW MAP - 01714247.182r

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Landfill Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Power transmission lines
- Oil & Gas pipelines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME:	Middletown USARC, CT	CLIENT:	CH2M Hill
ADDRESS:	499 MILE LANE	CONTACT:	Mary Beth Jacques
	MIDDLETOWN CT 06457	INQUIRY #:	01714247.182r
LAT/LONG:	41.5819 / 72.6926	DATE:	July 13, 2006

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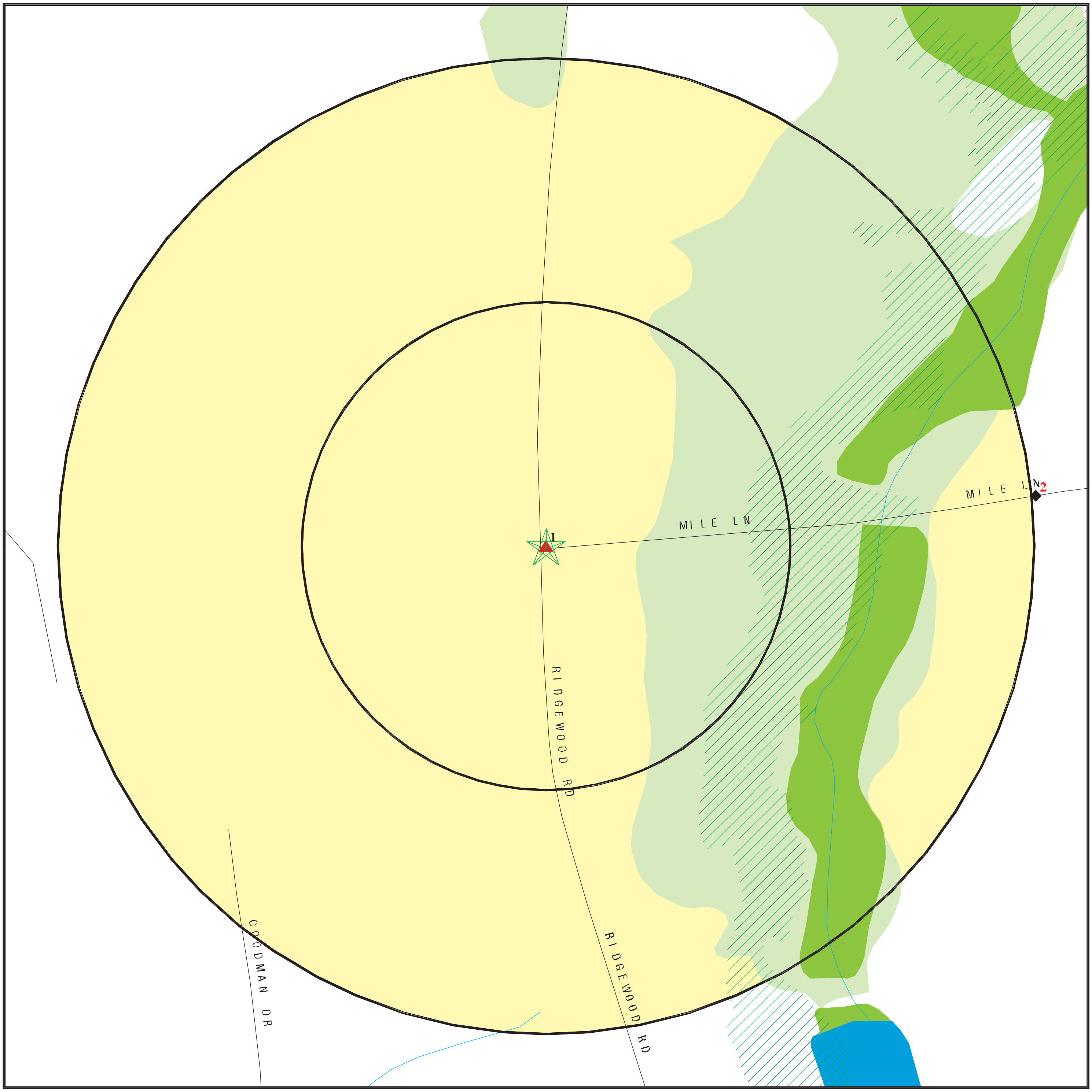
DETAIL MAP - 01714247.182r



0 1/16 1/8 1/4 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Landfill Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Oil & Gas pipelines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

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LAT/LONG:	41.5819 / 72.6926	DATE:	July 13, 2006

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MAP FINDINGS SUMMARY

Database	Target Property	Search Distance (Miles)	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
FEDERAL RECORDS								
NPL		1.000	0	0	0	0	NR	0
Proposed NPL		1.000	0	0	0	0	NR	0
Delisted NPL		1.000	0	0	0	0	NR	0
NPL RECOVERY		TP	NR	NR	NR	NR	NR	0
CERCLIS		0.500	0	0	0	NR	NR	0
CERC-NFRAP		0.500	0	0	0	NR	NR	0
CORRACTS		1.000	0	0	0	0	NR	0
RCRA TSD		0.500	0	0	0	NR	NR	0
RCRA Lg. Quan. Gen.		0.250	0	0	NR	NR	NR	0
RCRA Sm. Quan. Gen.		0.250	0	0	NR	NR	NR	0
ERNS		TP	NR	NR	NR	NR	NR	0
HMIRS		TP	NR	NR	NR	NR	NR	0
US ENG CONTROLS		0.500	0	0	0	NR	NR	0
US INST CONTROL		0.500	0	0	0	NR	NR	0
DOD		1.000	0	0	0	0	NR	0
FUDS		1.000	0	0	0	0	NR	0
US BROWNFIELDS		0.500	0	0	0	NR	NR	0
CONSENT		1.000	0	0	0	0	NR	0
ROD		1.000	0	0	0	0	NR	0
UMTRA		0.500	0	0	0	NR	NR	0
ODI		0.500	0	0	0	NR	NR	0
TRIS		TP	NR	NR	NR	NR	NR	0
TSCA		TP	NR	NR	NR	NR	NR	0
FTTS		TP	NR	NR	NR	NR	NR	0
SSTS		TP	NR	NR	NR	NR	NR	0
ICIS		TP	NR	NR	NR	NR	NR	0
PADS		TP	NR	NR	NR	NR	NR	0
MLTS		TP	NR	NR	NR	NR	NR	0
MINES		0.250	0	0	NR	NR	NR	0
FINDS		TP	NR	NR	NR	NR	NR	0
RAATS		TP	NR	NR	NR	NR	NR	0
STATE AND LOCAL RECORDS								
State Haz. Waste		1.000	0	0	0	1	NR	1
SDADB		0.500	0	0	0	NR	NR	0
State Landfill		0.500	0	0	0	NR	NR	0
SWRCY		0.500	0	0	0	NR	NR	0
LUST		0.500	0	0	1	NR	NR	1
LWDS		1.000	0	0	0	0	NR	0
UST		0.250	0	0	NR	NR	NR	0
AST		0.250	0	0	NR	NR	NR	0
MANIFEST	X	0.250	0	0	NR	NR	NR	0
CT Spills		TP	NR	NR	NR	NR	NR	0
AUL		0.500	0	0	0	NR	NR	0
VCP		0.500	0	0	0	NR	NR	0
DRYCLEANERS		0.250	0	0	NR	NR	NR	0
BROWNFIELDS		0.500	0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Target Property	Search Distance (Miles)	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
ENF		TP	NR	NR	NR	NR	NR	0
CT Property		TP	NR	NR	NR	NR	NR	0
TRIBAL RECORDS								
INDIAN RESERV		1.000	0	0	0	0	NR	0
INDIAN LUST R1		0.500	0	0	0	NR	NR	0
INDIAN UST R1		0.250	0	0	NR	NR	NR	0
EDR PROPRIETARY RECORDS								
Manufactured Gas Plants		1.000	0	0	0	0	NR	0
EDR Historical Auto Stations		TP	NR	NR	NR	NR	NR	0
EDR Historical Cleaners		TP	NR	NR	NR	NR	NR	0

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

Map ID Direction Distance Distance (ft.) Elevation	Site	Database(s)	EDR ID Number EPA ID Number
1 **Target** **Property**	**US ARMY RESERVE CENTER** **499 MILE RD** **MIDDLETOWN, CT 06457**	**NY MANIFEST**	**1009220557** **N/A**

Actual:
104 ft.

NY MANIFEST:

Document ID:	NYB9299304
Manifest Status:	Not reported
Trans1 State ID:	NJD054126164
Trans2 State ID:	Not reported
Generator Ship Date:	01/23/2001
Trans1 Recv Date:	01/23/2001
Trans2 Recv Date:	Not reported
TSD Site Recv Date:	02/06/2001
Part A Recv Date:	Not reported
Part B Recv Date:	Not reported
Generator EPA ID:	CTP000024359
Trans1 EPA ID:	NYD049836679
Trans2 EPA ID:	Not reported
TSDF ID:	0448291ME
Waste Code:	B006 - PCB TRANSFORMERS WITH 500 PPM OR > PCB
Quantity:	00325
Units:	K - Kilograms (2.2 pounds)
Number of Containers:	001
Container Type:	DM - Metal drums, barrels
Handling Method:	L Landfill.
Specific Gravity:	01.00
Year:	01
Facility Type:	Generator
EPA ID:	CTP000024359
Facility Name:	US ARMY RESERVE CENTER
Facility Address:	499 MILE RD
Facility City:	MIDDLETOWN
Facility Zip 4:	Not reported
Country:	USA
County:	Not reported
Mailing Name:	US ARMY RESERVE CENTER
Mailing Contact:	PAUL DUFFY
Mailing Address:	499 MILE RD
Mailing City:	MIDDLETOWN
Mailing State:	CT
Mailing Zip:	06457
Mailing Zip4:	Not reported
Mailing Country:	USA
Mailing Phone:	877-519-8533

Click this hyperlink while viewing on your computer to access additional NY MANIFEST: detail in the EDR Site Report.

---

2 **East** **1/4-1/2** **1330 ft.**	**KASDEN ELM CITY** **397 MILE LANE** **MIDDLETOWN, CT 06457**	**LUST** **CT Spills**	**S105440254** **N/A**

Relative:
Lower

Actual:
39 ft.

LUST:

LUST Case Id:	34042
Cost Recovery Spill Case #:	Not reported
Site Case Id:	9802938
Old SITS Number:	Not reported
UST Site Id:	Not reported
LUST ID:	5917

KASDEN ELM CITY (Continued) **S105440254**

Case Log Id:	Not reported
Monthly Report Id:	0
UST Facility Id:	Not reported
UST Owner Id:	Not reported
UST Event Id:	6032
Contact Info:	Not reported
Facility City Num:	83
Incident Date:	05/14/98
Entry Date:	Not reported
Site Contact:	Not reported
Site Contact Address:	Not reported
Site Contact City,St,Zip:	0
Site Contact Add 2:	Not reported
Site Contact City 2:	Not reported
Site Contact Phone:	Not reported
Site Contact Fax:	Not reported
Site Contact Type:	Not reported
2nd Contact:	Not reported
2nd Contact Address:	Not reported
2nd Contact City,St,Zip:	0
2nd Contact Address 2:	Not reported
2nd Contact City 2:	Not reported
2nd Contact Phone Number:	Not reported
2nd Contact Fax Number:	Not reported
2nd Contact Type:	Not reported
Department Contact 1:	Not reported
Department Contact 2:	Not reported
Referral Source:	Not reported
Date Referred:	Not reported
Private Heating Fuel:	False
Commercial Heating Fuel:	True
Commercial HF < 2100 Gal.:	False
Commercial HF > 2100 Gal.:	False
Commercial HF - Size Unk:	True
Motor Fuel:	False
Diesel:	False
Gasoline:	False
Other Release:	Not reported
No Release:	False
No LUST Site:	False
Leak:	False
Tank:	False
Piping:	False
Overfill:	False
Removal:	False
Cost Recvry Prgm Candidate:	False
OCSRD Complete:	True
Responsible Party:	False
Follow Up Flag:	False
Alternate Water Supply:	False
Relocation:	False
Resp Party Name:	Not reported
Resp Party Address:	Not reported
Resp Party City,St,Zip:	Not reported
Resp Party Town Number:	0
Resp Party Phone:	Not reported
Resp Party Fax:	Not reported

KASDEN ELM CITY (Continued) **S105440254**

Resp Party Name 2:	Not reported
Resp Party Address 2:	Not reported
Resp Party Phone 2:	Not reported
LUST Owner Id:	Not reported
Investigator Id:	35
Follow Update:	Not reported
Lust Status:	Completed
Processing Status:	Not reported
Area Lextent:	Not reported
Annual Precipitation:	Not reported
Effected Population:	Not reported
Population Setting:	Not reported
Ground Water Direction:	Not reported
Ground Water Gradient:	Not reported
Hydro Basin:	Not reported
Drastic:	Not reported
Geo Setting:	Not reported
Ground Water Classification:	Not reported
Receptor:	Not reported
Ground Water Flow Direction:	Not reported
Ground Water Depth:	Not reported
Areas Of Concern:	Not reported
Free Product Inches:	Not reported
Fund Date:	Not reported
Fund Planned:	No
Fund Obligated:	No
Fund Outlayed:	No
Fund Judgment:	No
Fund Recovered:	No
Cellar Borings:	False
Install Micro Wells:	False
Ground Water Sample:	False
Soil Sample:	False
Soil Gas:	False
Site Inspect:	False
Soil Excavate:	False
Geo Probe:	False
Survey:	False
Potable Well Sample:	False
Sample MWS:	False
Ground Water Gauging:	False
Soil Venting:	False
Active:	False
NOV Action:	None
NOV Issued:	Not reported
NOV Due:	Not reported
NOV Received:	Not reported
NOV Closed:	Not reported
NOV Disc Date:	Not reported
NOV Issued Date:	Not reported
NOV Compliance Sched:	Not reported
NOV Admin Order:	Not reported
NOV Referred To Ag:	Not reported
Stop All NOV Actions:	False
Release Invest Rpt:	False
DEP App Letter 1:	False
Correct Action Plan:	False

KASDEN ELM CITY (Continued) **S105440254**

DEP App Letter 2: False
Rem Sys Install: False
Rem Sys Install Date: Not reported
Closure Date: Not reported
Rem Sys Monitoring Rpt: False
Qrtly Gwater Mon Rpts: False
Closure Req Rpt: False
DEP Closure Letter: False
Referred To: Not reported
No Wells: Not reported
Lph Wells: Not reported
User Stamp: Not reported
Date Stamp: Not reported
Correspondence: Not reported
Environmental Impact: Not reported
Follow Up: Not reported
GW Comments: Not reported
Location Desc: Not reported
NOV COmments: Not reported
Release Desc: Not reported
Running Comments: #2 FUEL OIL, , REMOVE SOIL
Work Performed: Not reported

SPILL:

Year of Database: 5/7/1998 0:00:00
Who Took Spill: 208
Report Date: 5/7/1998 0:00:00
Date Release: 5/7/1998 0:00:00
Reported By: dolly
Representing: casden elm city fuel
Terminated: YES
Total (Water): 0.00
Date Responded: Not reported
Case Number: 9802763
Assigned To: 0
Report Time: 5/7/1998 21:46:39
Time Responded: Not reported
Phone: 203 2340684
Recovd (Total): 0.00
Facility Status: Closed
Time Responded: Not reported
Who Assigned Spill: Not reported
Continuous Spill: No
Released Substance: #2 fuel oil
Qty: 1.00 (Gallons)
Emergency Measure: cleaned
Water Body: Not reported
Discharger: Not reported
Telephone: Not reported
Discharger Addr: Not reported
Dicharger City,St,Zip: Not reported
Responsible Party: Not reported
RP Address 1: Not reported
RP City,St,Zip: CT
Property Owner Name: Not reported
Property Owner Phone: Not reported
Property Owner Address: Not reported
Property Owner 1 City,ST,Zip: Not reported
Historic: No
Qty Rec Water: Not reported
OPA: Not reported
EPA Time: Not reported
EPA Contact: Not reported
USCG Contact: Not reported
USCG Time: Not reported
Waterbody: 0
Waterway: Not reported
EPA: Not reported
EPA Date: Not reported
USCG: Not reported
USCG Date: Not reported

KASDEN ELM CITY (Continued) **S105440254**

Spill Fund:	Not reported	Authorized By:	Not reported
Date Authorized:	Not reported	Time Authorized:	Not reported
OCSRD Rep:	Not reported	Accepted By:	Not reported
Time Authorized:	Not reported	Date Accepted:	Not reported
Transportation:	Not reported	Make:	Not reported
Registration:	Not reported	Tractor No:	Not reported
Trailer Registrtn:	Not reported		
Vehicle Operator:	Not reported	License No:	Not reported
Vehicle Owner:	Not reported	Owner Phone:	Not reported
Special Contact:	Not reported	Contractor Retained:	Not reported
Time Requested:	Not reported	Date Requested:	Not reported
Date Arrived:	Not reported	Time Arrived:	Not reported
Time Stamp:	5/8/1998 10:06:33		
Sr Inspector:	Monarca, Vincent	At Inspctor:	**NO RESPONSE
Sign 1:	<	Sign 2:	Not reported
Sign 3:	Not reported	Sign 4:	Not reported
Sign 5:	Not reported	Sign 6:	Not reported
Sign 7:	Not reported	User Stamp:	Not reported
Action ID:	11		
Other Action:	Not reported		
Agency ID:	8		
Other Agency:	Not reported		
DEP Bureau:	Not reported		
DEP Agency:	Not reported		
Cause ID:	4		
Other Cause:	Not reported		
Media ID:	4		
Other Media:	Not reported		
Class ID:	Not reported		
Other Class:	Not reported		
Release ID:	1		
Other Release:	Not reported		
Waterbody ID:	Not reported		
Other Wtrbody:	Not reported		

Year of Database:	5/14/1998 0:00:00	Case Number:	9802938
Who Took Spill:	934	Assigned To:	0
Report Date:	5/14/1998 0:00:00	Report Time:	5/14/1998 14:25:23
Date Release:	5/14/1998 0:00:00	Time Responded:	Not reported
Reported By:	KASDEN ELM CITY	Phone:	860 2349276
Representing:	Self		
Terminated:	YES	Recovd (Total):	1.00
Total (Water):	0.00	Facility Status:	Closed
Date Responded:	Not reported	Time Responded:	Not reported

Who Assigned Spill:	Not reported
Continuous Spill:	No
Released Substance:	#2 FUEL OIL
Qty:	1.00 (Gallons)
Emergency Measure:	REMOVE SOIL
Water Body:	NONE
Discharger:	SAME
Telephone:	Not reported
Discharger Addr:	Not reported
Dicharger City,St,Zip:	Not reported
Responsible Party:	YES
RP Address 1:	Not reported
RP City,St,Zip:	CT

KASDEN ELM CITY (Continued) **S105440254**

Property Owner Name:	Not reported		
Property Owner Phone:	Not reported		
Property Owner Address:	Not reported		
Property Owner 1 City,ST,Zip:	Not reported		
Historic:	No	Waterbody:	0
Qty Rec Water:	Not reported	Waterway:	Not reported
OPA:	Not reported	EPA:	Not reported
EPA Time:	Not reported	EPA Date:	Not reported
EPA Contact:	Not reported		
USCG Contact:	Not reported	USCG:	Not reported
USCG Time:	Not reported	USCG Date:	Not reported
Spill Fund:	Not reported	Authorized By:	Not reported
Date Authorized:	Not reported	Time Authorized:	Not reported
OCSRD Rep:	Not reported	Accepted By:	Not reported
Time Authorized:	Not reported	Date Accepted:	Not reported
Transportation:	Not reported	Make:	Not reported
Registration:	Not reported	Tractor No:	Not reported
Trailer Registrtn:	Not reported		
Vehicle Operator:	Not reported	License No:	Not reported
Vehicle Owner:	Not reported	Owner Phone:	Not reported
Special Contact:	Not reported	Contractor Retained:	Not reported
Time Requested:	Not reported	Date Requested:	Not reported
Date Arrived:	Not reported	Time Arrived:	Not reported
Time Stamp:	5/15/1998 8:03:19		
Sr Inspector:	Williamson, Matt	At Inspctor:	**NO RESPONSE
Sign 1:	Not reported	Sign 2:	Not reported
Sign 3:	Not reported	Sign 4:	Not reported
Sign 5:	Not reported	Sign 6:	Not reported
Sign 7:	Not reported	User Stamp:	Not reported
Action ID:	11		
Other Action:	Not reported		
Action ID:	18		
Other Action:	Not reported		
Agency ID:	8		
Other Agency:	Not reported		
DEP Bureau:	Not reported		
DEP Agency:	Not reported		
Cause ID:	3		
Other Cause:	Not reported		
Media ID:	4		
Other Media:	Not reported		
Class ID:	Not reported		
Other Class:	Not reported		
Release ID:	1		
Other Release:	Not reported		
Waterbody ID:	9		
Other Wtrbody:	N/A		

Map ID / Direction / Distance / Elevation	Site	Database(s)	EDR ID Number / EPA ID Number
3 **ENE** **1/2-1** **5258 ft.**	**J.J. VINCI COAL COMPANY** **1000 NEWFIELD STREET** **MIDDLETOWN, CT 06457**	**SHWS** **LUST** **CT Spills** **SDADB**	**S100996958** **N/A**

Relative:
Lower

Actual:
20 ft.

SHWS:

State ID:	694
PTP Id Number:	Not reported
WPC Number:	Not reported
EPA ID:	CTD983903659
PO Office:	Not reported
Lat/Long:	41.5864/-72.6671
Location Method:	UNK
Groundwater Class:	GB
Surface Water Qualification:	C/B
Waste Category:	CHLR VOC, SEMI VOC, METALS
Disposal Method:	LAGOON, DRUMS, UST
Sample:	True
Other Dept of Env. Protection:	HMMU
Updated By:	DANYLUK, M.
Update Program:	FPRE
Date Updated:	5/3/2000
Duplicate:	Not reported
Program:	7/13/1989
Inventory Date:	TT D & A
On Inventory:	Not reported
Assessed:	Not reported
87 Group:	Not reported
87 Origin:	F H
On 87:	Not reported
Comments:	DISPOSAL ACTIVITY: ALLEDGED BURIED DRUMS - LAGOON (7/89) OCSD RESPONDED TO SPILL OF #2 FUEL OIL ON 7/3/85. SPILL OF DIESEL FUEL ON 11/16/89. DEP ORDER 2500. (5/00)

LUST:

LUST Case Id:	31714
Cost Recovery Spill Case #:	Not reported
Site Case Id:	Not reported
Old SITS Number:	Not reported
UST Site Id:	Not reported
LUST ID:	3688
Case Log Id:	Not reported
Monthly Report Id:	0
UST Facility Id:	1555
UST Owner Id:	3693
UST Event Id:	3764
Contact Info:	Not reported
Facility City Num:	83
Incident Date:	07/15/89
Entry Date:	Not reported
Site Contact:	Not reported
Site Contact Address:	Not reported
Site Contact City,St,Zip:	0
Site Contact Add 2:	Not reported
Site Contact City 2:	Not reported
Site Contact Phone:	Not reported
Site Contact Fax:	Not reported
Site Contact Type:	Not reported
2nd Contact:	Not reported

J.J. VINCI COAL COMPANY (Continued) **S100996958**

2nd Contact Address:	Not reported
2nd Contact City,St,Zip:	0
2nd Contact Address 2:	Not reported
2nd Contact City 2:	Not reported
2nd Contact Phone Number:	Not reported
2nd Contact Fax Number:	Not reported
2nd Contact Type:	Not reported
Department Contact 1:	Not reported
Department Contact 2:	Not reported
Referral Source:	Not reported
Date Referred:	Not reported
Private Heating Fuel:	False
Commercial Heating Fuel:	False
Commercial HF < 2100 Gal.:	False
Commercial HF > 2100 Gal.:	False
Commercial HF - Size Unk:	False
Motor Fuel:	False
Diesel:	False
Gasoline:	False
Other Release:	Not reported
No Release:	False
No LUST Site:	False
Leak:	False
Tank:	False
Piping:	False
Overfill:	False
Removal:	False
Cost Recvry Prgm Candidate:	False
OCSRD Complete:	False
Responsible Party:	False
Follow Up Flag:	False
Alternate Water Supply:	False
Relocation:	False
Resp Party Name:	Not reported
Resp Party Address:	Not reported
Resp Party City,St,Zip:	Not reported
Resp Party Town Number:	0
Resp Party Phone:	Not reported
Resp Party Fax:	Not reported
Resp Party Name 2:	Not reported
Resp Party Address 2:	Not reported
Resp Party Phone 2:	Not reported
LUST Owner Id:	Not reported
Investigator Id:	Not reported
Follow Update:	Not reported
Lust Status:	Cleanup Initiated
Processing Status:	Not reported
Area Lextent:	Not reported
Annual Precipitation:	Not reported
Effected Population:	Not reported
Population Setting:	Not reported
Ground Water Direction:	Not reported
Ground Water Gradient:	Not reported
Hydro Basin:	Not reported
Drastic:	Not reported
Geo Setting:	Not reported
Ground Water Classification:	Not reported

J.J. VINCI COAL COMPANY (Continued) **S100996958**

Receptor:	Not reported
Ground Water Flow Direction:	Not reported
Ground Water Depth:	Not reported
Areas Of Concern:	Not reported
Free Product Inches:	Not reported
Fund Date:	Not reported
Fund Planned:	No
Fund Obligated:	No
Fund Outlayed:	No
Fund Judgment:	No
Fund Recovered:	No
Cellar Borings:	False
Install Micro Wells:	False
Ground Water Sample:	False
Soil Sample:	False
Soil Gas:	False
Site Inspect:	False
Soil Excavate:	False
Geo Probe:	False
Survey:	False
Potable Well Sample:	False
Sample MWS:	False
Ground Water Gauging:	False
Soil Venting:	False
Active:	False
NOV Action:	None
NOV Issued:	Not reported
NOV Due:	Not reported
NOV Received:	Not reported
NOV Closed:	Not reported
NOV Disc Date:	Not reported
NOV Issued Date:	Not reported
NOV Compliance Sched:	Not reported
NOV Admin Order:	Not reported
NOV Referred To Ag:	Not reported
Stop All NOV Actions:	False
Release Invest Rpt:	False
DEP App Letter 1:	False
Correct Action Plan:	False
DEP App Letter 2:	False
Rem Sys Install:	False
Rem Sys Install Date:	Not reported
Closure Date:	Not reported
Rem Sys Monitoring Rpt:	False
Qrtly Gwater Mon Rpts:	False
Closure Req Rpt:	False
DEP Closure Letter:	False
Referred To:	Not reported
No Wells:	Not reported
Lph Wells:	Not reported
User Stamp:	Not reported
Date Stamp:	Not reported
Correspondence:	Not reported
Environmental Impact:	Not reported
Follow Up:	Not reported
GW Comments:	Not reported
Location Desc:	Not reported

J.J. VINCI COAL COMPANY (Continued) **S100996958**

NOV COmments: Not reported
Release Desc: Not reported
Running Comments: One Piece of correspondence from Water Remediation Files received on 6/24/94 from TRC Environmental Corp. of Lowell, MA, states that USTs abandoned/removed in the past. Sampling, GB AREA. WO Contamination is associated with 4 potential areas. Potential receptors include the adjacent wetlands, river and fishery. According to the UST Notification Form dated 5/5/86, 4x20k tanks holding Asphalt-Waste-Oil were out of use for several years and were filled with sand. There were/are more than 20tanks at this facility storing a variety of chemicals. UST Notification Form 83-1555 dated 7/15/98 states that there is/was a 3000 gal. gasoline UST, 1x6k, 1x10k, and 1x2k DF UST in this facility which were put out of use in July of 1990. UST Notification Form 83-1555, dated 1/9/91 states that 2x3k, 1x2k gasoline and 2x6k DF tanks were removed from the subject facility in July of 1989.
Work Performed: Not reported

SPILL:

Year of Database:	7/26/1999 0:00:00	Case Number:	9904895
Who Took Spill:	208	Assigned To:	917
Report Date:	7/24/1999 0:00:00	Report Time:	12/30/1899 13:34:00
Date Release:	7/24/1999 0:00:00	Time Responded:	12/30/1899 13:35:00
Reported By:	ANONYMOUS	Phone:	000 0000000
Representing:	Self		
Terminated:	NO	Recovd (Total):	0.00
Total (Water):	0.00	Facility Status:	Closed
Date Responded:	Not reported	Time Responded:	Not reported

Who Assigned Spill: Not reported
Continuous Spill: No
Released Substance: OIL
Qty: 0.00 (Gallons)
Emergency Measure: NONE
Water Body: Not reported
Discharger: unknown
Telephone: Not reported
Discharger Addr: Not reported
Dicharger City,St,Zip: Not reported
Responsible Party: Not reported
RP Address 1: Not reported
RP City,St,Zip: CT
Property Owner Name: Not reported
Property Owner Phone: Not reported
Property Owner Address: Not reported
Property Owner 1 City,ST,Zip: Not reported

Historic:	No	Waterbody:	0
Qty Rec Water:	Not reported	Waterway:	Not reported
OPA:	Not reported	EPA:	Not reported
EPA Time:	Not reported	EPA Date:	Not reported
EPA Contact:	Not reported		
USCG Contact:	Not reported	USCG:	Not reported
USCG Time:	Not reported	USCG Date:	Not reported
Spill Fund:	Not reported	Authorized By:	Not reported
Date Authorized:	Not reported	Time Authorized:	Not reported
OCSRD Rep:	Not reported	Accepted By:	Not reported
Time Authorized:	Not reported	Date Accepted:	Not reported
Transportation:	Not reported	Make:	Not reported
Registration:	Not reported	Tractor No:	Not reported
Trailer Registrtn:	Not reported		

J.J. VINCI COAL COMPANY (Continued) **S100996958**

Vehicle Operator:	Not reported	License No:	Not reported
Vehicle Owner:	Not reported	Owner Phone:	Not reported
Special Contact:	Not reported	Contractor Retained:	Not reported
Time Requested:	Not reported	Date Requested:	Not reported
Date Arrived:	Not reported	Time Arrived:	Not reported
Time Stamp:	12/17/1999 14:53:46		
Sr Inspector:	Monarca, Vincent	At Inspctor:	Emanuelson, Brian
Sign 1:	Not reported	Sign 2:	Not reported
Sign 3:	Not reported	Sign 4:	Not reported
Sign 5:	Not reported	Sign 6:	Not reported
Sign 7:	Not reported	User Stamp:	Not reported
Action ID:	20		
Other Action:	none		
Agency ID:	Not reported		
Other Agency:	Not reported		
DEP Bureau:	Not reported		
DEP Agency:	Not reported		
Cause ID:	26		
Other Cause:	unknown		
Media ID:	6		
Other Media:	Unknown		
Class ID:	11		
Other Class:	unknown		
Release ID:	1		
Other Release:	Not reported		
Waterbody ID:	Not reported		
Other Wtrbody:	Not reported		

Facility ID:	694
Rem ID:	Not reported
PTP Id:	Not reported
WPC Number:	Not reported
Postal District:	Not reported
Latitude:	41.5864
Longitude:	-72.6671
Lat/Long Determined By:	UNK
Ground Water Quality Classification:	GB
Surface Water Quality Classification:	C/B
Waste Type:	CHLR VOC, SEMI VOC, METALS
Disposal:	LAGOON, DRUMS, UST
Sample Data Available:	Yes
Updated By:	DANYLUK, M.
Update Program:	FPRE
Updated:	5/3/2000
Duplicate:	No
EPA CERCLIS Id:	Not reported
Number EPA RCRIS Id:	Not reported
Site on EPA's CERCLIS:	Yes
Site Archived from CERCLIS:	No
Archive Date:	Not reported
EPA's Removal at Site:	No
Deferred to another EPA Program:	No
EPA Env Priority Initiative Site:	No
Federal Facility:	No
Site on EPA's National Priority List:	No
Part of an NPL site:	No
RCRA Generator Status:	Not reported

J.J. VINCI COAL COMPANY (Continued) **S100996958**

RCRA Permit Status:	Not reported
Referral Id:	658
Source of referral:	SUPERFUND
Date Received:	1/1/1989
Staff Assigned:	POST, M.
Remediation Program:	D&A
Date assigned:	Not reported
Remediation Complete Approved DEP/Verified by LEP:	7/13/1989
Outcome:	INVENTORY
Remedial Id:	Not reported
PTP Id:	Not reported
Remediation Program:	Not reported
Remediation Program Entered:	Not reported
Staff Assigned:	Not reported
Remediation Program:	Not reported
Date assigned:	Not reported
Project Phase:	Not reported
Order issued:	Not reported
Order Number:	Not reported
Date order issued:	Not reported
Remedial Investigation Start:	Not reported
Remedial Investigation Completed:	Not reported
Remedial Design Start:	Not reported
Remedial Design complet:	Not reported
Remedial Action Start:	Not reported
Remedial Action Completed:	Not reported
Date Oper/ maintenance Started:	Not reported
GW monitoring:	Not reported
Remediation complete Approved DEP/Verified by LEP:	Not reported
Order Id:	Not reported
Order Number:	Not reported
Date order issued:	Not reported
Staff Assigned:	Not reported
Type of Order:	Not reported
Order Respondent:	Not reported
Admin Appeal Date:	Not reported
Date of Admin Appeal Ruling:	Not reported
Date of Admin Appeal Ruling:	Not reported
Date of Final Order:	Not reported
Date of Court Appeal:	Not reported
Date of Court Ruling:	Not reported
Date of Court Ruling:	Not reported
Date Order Modified:	Not reported
Date Order Revoked:	Not reported
Date Referred to AG:	Not reported
Judgement:	Not reported
Date of AGR judgement:	Not reported
Penalty assessed:	Not reported
Order Complete:	Not reported
In compliance:	Not reported
Orders Comment:	Not reported
Comments:	DISPOSAL ACTIVITY: ALLEDGED BURIED DRUMS - LAGOON (7/89) OCSD RESPONDED TO SPILL OF #2 FUEL OIL ON 7/3/85. SPILL OF DIESEL FUEL ON 11/16/89. DEP ORDER 2500. (5/00)

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
MIDDLETOWN	1001481209	WADSWORTH FALLS STATE PARK	ROUTE 157	06457	RCRA-SQG, FINDS
MIDDLETOWN	1007896235	MIDDLETOWN TOWN GARAGE	ROUTE 66		CT MANIFEST
MIDDLETOWN	1007892961	CITY OF MIDDLETOWN, MT. HIGBY RESE	ROUTE 66		CT MANIFEST
MIDDLETOWN	S106660503		ROUTE 72		SWF/LF
MIDDLETOWN	1007910266	CONNECTICUT DEAPRTMENT OF TRANSPOR	ROUTE 9 SOUTH		CT MANIFEST
MIDDLETOWN	1007905091	PHOENIX PRODUCTS COMPANY	ROUTE 91 NORTH @ REST AREA		CT MANIFEST
MIDDLETOWN	S102413726	ARMY RESERVE CENTER	MILE LN.	06457	LUST
MIDDLETOWN	S102958392		NEWFIELD STREET		SWF/LF, CT Spills
MIDDLETOWN	1007906935	BISH ELECTRIC	76 WEST STREET (RTE 66)	06457	CT MANIFEST
MIDDLETOWN	1009220627	CT DEPT OF TRANSPORTATION	UNION ST OV RTE 9	06457	NY MANIFEST

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Number of Days to Update: Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

FEDERAL RECORDS

NPL: National Priority List

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 04/19/2006
Date Data Arrived at EDR: 05/05/2006
Date Made Active in Reports: 05/22/2006
Number of Days to Update: 17

Source: EPA
Telephone: N/A
Last EDR Contact: 05/05/2006
Next Scheduled EDR Contact: 07/31/2006
Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 3
Telephone 215-814-5418

EPA Region 4
Telephone 404-562-8033

EPA Region 6
Telephone: 214-655-6659

EPA Region 8
Telephone: 303-312-6774

Proposed NPL: Proposed National Priority List Sites

Date of Government Version: 04/19/2006
Date Data Arrived at EDR: 05/05/2006
Date Made Active in Reports: 05/22/2006
Number of Days to Update: 17

Source: EPA
Telephone: N/A
Last EDR Contact: 05/05/2006
Next Scheduled EDR Contact: 07/31/2006
Data Release Frequency: Quarterly

DELISTED NPL: National Priority List Deletions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 04/19/2006
Date Data Arrived at EDR: 05/05/2006
Date Made Active in Reports: 05/22/2006
Number of Days to Update: 17

Source: EPA
Telephone: N/A
Last EDR Contact: 05/05/2006
Next Scheduled EDR Contact: 07/31/2006
Data Release Frequency: Quarterly

NPL RECOVERY: Federal Superfund Liens

Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991
Date Data Arrived at EDR: 02/02/1994
Date Made Active in Reports: 03/30/1994
Number of Days to Update: 56

Source: EPA
Telephone: 202-564-4267
Last EDR Contact: 05/23/2006
Next Scheduled EDR Contact: 08/21/2006
Data Release Frequency: No Update Planned

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System

CERCLIS contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to or on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 02/01/2006
Date Data Arrived at EDR: 03/21/2006
Date Made Active in Reports: 04/13/2006
Number of Days to Update: 23

Source: EPA
Telephone: 703-413-0223
Last EDR Contact: 06/22/2006
Next Scheduled EDR Contact: 09/18/2006
Data Release Frequency: Quarterly

CERCLIS-NFRAP: CERCLIS No Further Remedial Action Planned

Archived sites are sites that have been removed and archived from the inventory of CERCLIS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list this site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. This decision does not necessarily mean that there is no hazard associated with a given site; it only means that, based upon available information, the location is not judged to be a potential NPL site.

Date of Government Version: 02/01/2006
Date Data Arrived at EDR: 03/21/2006
Date Made Active in Reports: 04/13/2006
Number of Days to Update: 23

Source: EPA
Telephone: 703-413-0223
Last EDR Contact: 06/23/2006
Next Scheduled EDR Contact: 09/18/2006
Data Release Frequency: Quarterly

CORRACTS: Corrective Action Report

CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 03/15/2006
Date Data Arrived at EDR: 03/17/2006
Date Made Active in Reports: 04/13/2006
Number of Days to Update: 27

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 05/21/2006
Next Scheduled EDR Contact: 09/04/2006
Data Release Frequency: Quarterly

RCRA: Resource Conservation and Recovery Act Information

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System (RCRIS). The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month. Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month. Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month. Transporters are individuals or entities that move hazardous waste from the generator off-site to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 03/09/2006
Date Data Arrived at EDR: 04/27/2006
Date Made Active in Reports: 05/30/2006
Number of Days to Update: 33

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 06/28/2006
Next Scheduled EDR Contact: 08/21/2006
Data Release Frequency: Quarterly

ERNS: Emergency Response Notification System

Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 01/12/2006
Date Made Active in Reports: 02/21/2006
Number of Days to Update: 40

Source: National Response Center, United States Coast Guard
Telephone: 202-260-2342
Last EDR Contact: 04/26/2006
Next Scheduled EDR Contact: 07/24/2006
Data Release Frequency: Annually

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

HMIRS: Hazardous Materials Information Reporting System
Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 04/14/2006
Date Made Active in Reports: 05/30/2006
Number of Days to Update: 46

Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 04/14/2006
Next Scheduled EDR Contact: 07/17/2006
Data Release Frequency: Annually

US ENG CONTROLS: Engineering Controls Sites List
A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 03/21/2006
Date Data Arrived at EDR: 03/27/2006
Date Made Active in Reports: 05/22/2006
Number of Days to Update: 56

Source: Environmental Protection Agency
Telephone: 703-603-8905
Last EDR Contact: 07/03/2006
Next Scheduled EDR Contact: 10/02/2006
Data Release Frequency: Varies

US INST CONTROL: Sites with Institutional Controls
A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 03/21/2006
Date Data Arrived at EDR: 03/27/2006
Date Made Active in Reports: 05/22/2006
Number of Days to Update: 56

Source: Environmental Protection Agency
Telephone: 703-603-8905
Last EDR Contact: 07/03/2006
Next Scheduled EDR Contact: 10/02/2006
Data Release Frequency: Varies

DOD: Department of Defense Sites
This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 12/31/2004
Date Data Arrived at EDR: 02/08/2005
Date Made Active in Reports: 08/04/2005
Number of Days to Update: 177

Source: USGS
Telephone: 703-692-8801
Last EDR Contact: 05/12/2006
Next Scheduled EDR Contact: 08/07/2006
Data Release Frequency: Semi-Annually

FUDS: Formerly Used Defense Sites
The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 12/05/2005
Date Data Arrived at EDR: 01/19/2006
Date Made Active in Reports: 02/21/2006
Number of Days to Update: 33

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 07/03/2006
Next Scheduled EDR Contact: 10/02/2006
Data Release Frequency: Varies

US BROWNFIELDS: A Listing of Brownfields Sites

Included in the listing are brownfields properties addresses by Cooperative Agreement Recipients and brownfields properties addressed by Targeted Brownfields Assessments. Targeted Brownfields Assessments-EPA's Targeted Brownfields Assessments (TBA) program is designed to help states, tribes, and municipalities--especially those without EPA Brownfields Assessment Demonstration Pilots--minimize the uncertainties of contamination often associated with brownfields. Under the TBA program, EPA provides funding and/or technical assistance for environmental assessments at brownfields sites throughout the country. Targeted Brownfields Assessments supplement and work with other efforts under EPA's Brownfields Initiative to promote cleanup and redevelopment of brownfields. Cooperative Agreement Recipients-States, political subdivisions, territories, and Indian tribes become Brownfields Cleanup Revolving Loan Fund (BCRLF) cooperative agreement recipients when they enter into BCRLF cooperative agreements with the U.S. EPA. EPA selects BCRLF cooperative agreement recipients based on a proposal and application process. BCRLF cooperative agreement recipients must use EPA funds provided through BCRLF cooperative agreement for specified brownfields-related cleanup activities.

Date of Government Version: 04/26/2006
Date Data Arrived at EDR: 04/27/2006
Date Made Active in Reports: 05/30/2006
Number of Days to Update: 33

Source: Environmental Protection Agency
Telephone: 202-566-2777
Last EDR Contact: 06/12/2006
Next Scheduled EDR Contact: 09/11/2006
Data Release Frequency: Semi-Annually

CONSENT: Superfund (CERCLA) Consent Decrees

Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 12/14/2004
Date Data Arrived at EDR: 02/15/2005
Date Made Active in Reports: 04/25/2005
Number of Days to Update: 69

Source: Department of Justice, Consent Decree Library
Telephone: Varies
Last EDR Contact: 03/13/2006
Next Scheduled EDR Contact: 07/24/2006
Data Release Frequency: Varies

ROD: Records Of Decision

Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 04/13/2006
Date Data Arrived at EDR: 04/28/2006
Date Made Active in Reports: 05/30/2006
Number of Days to Update: 32

Source: EPA
Telephone: 703-416-0223
Last EDR Contact: 07/06/2006
Next Scheduled EDR Contact: 10/02/2006
Data Release Frequency: Annually

UMTRA: Uranium Mill Tailings Sites

Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

Date of Government Version: 11/04/2005
Date Data Arrived at EDR: 11/28/2005
Date Made Active in Reports: 01/30/2006
Number of Days to Update: 63

Source: Department of Energy
Telephone: 505-845-0011
Last EDR Contact: 06/21/2006
Next Scheduled EDR Contact: 09/18/2006
Data Release Frequency: Varies

ODI: Open Dump Inventory

An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39

Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

TRIS: Toxic Chemical Release Inventory System

Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2003
Date Data Arrived at EDR: 07/13/2005
Date Made Active in Reports: 08/17/2005
Number of Days to Update: 35

Source: EPA
Telephone: 202-566-0250
Last EDR Contact: 06/22/2006
Next Scheduled EDR Contact: 09/18/2006
Data Release Frequency: Annually

TSCA: Toxic Substances Control Act

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2002
Date Data Arrived at EDR: 04/14/2006
Date Made Active in Reports: 05/30/2006
Number of Days to Update: 46

Source: EPA
Telephone: 202-260-5521
Last EDR Contact: 04/12/2006
Next Scheduled EDR Contact: 07/17/2006
Data Release Frequency: Every 4 Years

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 03/29/2006
Date Data Arrived at EDR: 04/26/2006
Date Made Active in Reports: 05/30/2006
Number of Days to Update: 34

Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
Last EDR Contact: 06/19/2006
Next Scheduled EDR Contact: 09/18/2006
Data Release Frequency: Quarterly

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

Date of Government Version: 03/31/2006
Date Data Arrived at EDR: 04/26/2006
Date Made Active in Reports: 05/30/2006
Number of Days to Update: 34

Source: EPA
Telephone: 202-566-1667
Last EDR Contact: 06/19/2006
Next Scheduled EDR Contact: 09/18/2006
Data Release Frequency: Quarterly

SSTS: Section 7 Tracking Systems

Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/2004
Date Data Arrived at EDR: 05/11/2006
Date Made Active in Reports: 05/22/2006
Number of Days to Update: 11

Source: EPA
Telephone: 202-564-4203
Last EDR Contact: 03/06/2006
Next Scheduled EDR Contact: 07/17/2006
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System

The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 02/13/2006
Date Data Arrived at EDR: 04/21/2006
Date Made Active in Reports: 05/11/2006
Number of Days to Update: 20

Source: Environmental Protection Agency
Telephone: 202-564-5088
Last EDR Contact: 04/11/2006
Next Scheduled EDR Contact: 07/17/2006
Data Release Frequency: Quarterly

PADS: PCB Activity Database System

PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 12/27/2005
Date Data Arrived at EDR: 02/08/2006
Date Made Active in Reports: 02/27/2006
Number of Days to Update: 19

Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 06/28/2006
Next Scheduled EDR Contact: 08/07/2006
Data Release Frequency: Annually

MLTS: Material Licensing Tracking System

MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/12/2006
Date Data Arrived at EDR: 04/26/2006
Date Made Active in Reports: 05/30/2006
Number of Days to Update: 34

Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
Last EDR Contact: 07/03/2006
Next Scheduled EDR Contact: 10/02/2006
Data Release Frequency: Quarterly

MINES: Mines Master Index File

Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 02/09/2006
Date Data Arrived at EDR: 03/29/2006
Date Made Active in Reports: 05/30/2006
Number of Days to Update: 62

Source: Department of Labor, Mine Safety and Health Administration
Telephone: 303-231-5959
Last EDR Contact: 06/28/2006
Next Scheduled EDR Contact: 09/25/2006
Data Release Frequency: Semi-Annually

FINDS: Facility Index System/Facility Registry System

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 04/27/2006
Date Data Arrived at EDR: 05/02/2006
Date Made Active in Reports: 05/30/2006
Number of Days to Update: 28

Source: EPA
Telephone: N/A
Last EDR Contact: 04/03/2006
Next Scheduled EDR Contact: 07/03/2006
Data Release Frequency: Quarterly

RAATS: RCRA Administrative Action Tracking System

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995
Date Data Arrived at EDR: 07/03/1995
Date Made Active in Reports: 08/07/1995
Number of Days to Update: 35

Source: EPA
Telephone: 202-564-4104
Last EDR Contact: 06/05/2006
Next Scheduled EDR Contact: 09/04/2006
Data Release Frequency: No Update Planned

BRS: Biennial Reporting System

The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2003
Date Data Arrived at EDR: 06/17/2005
Date Made Active in Reports: 08/04/2005
Number of Days to Update: 48

Source: EPA/NTIS
Telephone: 800-424-9346
Last EDR Contact: 06/30/2006
Next Scheduled EDR Contact: 09/11/2006
Data Release Frequency: Biennially

STATE AND LOCAL RECORDS

SHWS: Inventory of Hazardous Disposal Sites

State Hazardous Waste Sites. State hazardous waste site records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. Available information varies by state.

Date of Government Version: 05/19/2006
Date Data Arrived at EDR: 05/19/2006
Date Made Active in Reports: 06/28/2006
Number of Days to Update: 40

Source: Department of Environmental Protection
Telephone: 860-424-3721
Last EDR Contact: 05/19/2006
Next Scheduled EDR Contact: 07/31/2006
Data Release Frequency: Varies

SDADB: Site Discovery and Assessment Database

All sites reported to Permitting, Enforcement, and Remediation Division where it is suspected that hazardous waste may have been disposed or sites that are eligible for listing on the State Inventory of Hazardous Waste Disposal Sites.

Date of Government Version: 05/19/2006
Date Data Arrived at EDR: 05/19/2006
Date Made Active in Reports: 06/28/2006
Number of Days to Update: 40

Source: Department of Environmental Protection
Telephone: 860-424-3721
Last EDR Contact: 05/19/2006
Next Scheduled EDR Contact: 07/31/2006
Data Release Frequency: Semi-Annually

SWF/LF: List of Landfills/Transfer Stations

Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 04/03/2006
Date Data Arrived at EDR: 06/09/2006
Date Made Active in Reports: 06/28/2006
Number of Days to Update: 19

Source: Department of Environmental Protection
Telephone: 860-424-3366
Last EDR Contact: 05/23/2006
Next Scheduled EDR Contact: 08/21/2006
Data Release Frequency: Annually

SWRCY: Recycling Facilities

A listing of recycling facilities.

Date of Government Version: 04/03/2006
Date Data Arrived at EDR: 06/09/2006
Date Made Active in Reports: 06/28/2006
Number of Days to Update: 19

Source: Department of Environmental Protection
Telephone: 860-424-3223
Last EDR Contact: 05/23/2006
Next Scheduled EDR Contact: 08/21/2006
Data Release Frequency: Varies

LUST: Leaking Underground Storage Tank List

Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state.

Date of Government Version: 05/23/2006
Date Data Arrived at EDR: 05/25/2006
Date Made Active in Reports: 06/28/2006
Number of Days to Update: 34

Source: Department of Environmental Protection
Telephone: 860-424-3376
Last EDR Contact: 05/01/2006
Next Scheduled EDR Contact: 07/31/2006
Data Release Frequency: Semi-Annually

LWDS: Connecticut Leachate and Wastewater Discharge Sites

The Leachate and Waste Water Discharge Inventory Data Layer (LWDS) includes point locations digitized from Leachate and Wastewater Discharge Source maps compiled by the Connecticut DEP. These maps locate surface and groundwater discharges that (1) have received a waste water discharge permit from the state or (2) are historic and now defunct waste sites or (3) are locations of accidental spills, leaks, or discharges of a variety of liquid or solid wastes.

Date of Government Version: 09/22/1999
Date Data Arrived at EDR: 11/15/1999
Date Made Active in Reports: 12/09/1999
Number of Days to Update: 24

Source: Department of Environmental Protection
Telephone: N/A
Last EDR Contact: 05/08/2006
Next Scheduled EDR Contact: 08/07/2006
Data Release Frequency: Varies

UST: Underground Storage Tank Data

Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

Date of Government Version: 03/01/2006
Date Data Arrived at EDR: 03/31/2006
Date Made Active in Reports: 04/26/2006
Number of Days to Update: 26

Source: Department of Environmental Protection
Telephone: 860-424-3376
Last EDR Contact: 07/10/2006
Next Scheduled EDR Contact: 09/25/2006
Data Release Frequency: Semi-Annually

AST: Marine Terminals and Tank Information

A listing of bulk petroleum facilities that receive petroleum by a vessel.

Date of Government Version: 10/28/2004
Date Data Arrived at EDR: 10/28/2004
Date Made Active in Reports: 12/09/2004
Number of Days to Update: 42

Source: Department of Environmental Protection
Telephone: 860-424-3233
Last EDR Contact: 06/30/2006
Next Scheduled EDR Contact: 09/18/2006
Data Release Frequency: Varies

CT MANIFEST: Hazardous Waste Manifest Data

Facility and manifest data. Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a tsd facility.

Date of Government Version: 12/31/2004
Date Data Arrived at EDR: 02/17/2006
Date Made Active in Reports: 04/07/2006
Number of Days to Update: 49

Source: Department of Environmental Protection
Telephone: 860-424-3375
Last EDR Contact: 06/14/2006
Next Scheduled EDR Contact: 09/11/2006
Data Release Frequency: Annually

SPILLS: Oil & Chemical Spill Database

Oil and Chemical Spill Data.

Date of Government Version: 05/17/2006
Date Data Arrived at EDR: 05/22/2006
Date Made Active in Reports: 06/28/2006
Number of Days to Update: 37

Source: Department of Environmental Protection
Telephone: 860-424-3024
Last EDR Contact: 05/01/2006
Next Scheduled EDR Contact: 05/01/2006
Data Release Frequency: Semi-Annually

AUL: ELUR Sites

Environmental Land Use Restriction sites.

Date of Government Version: 03/27/2006
Date Data Arrived at EDR: 03/28/2006
Date Made Active in Reports: 05/01/2006
Number of Days to Update: 34

Source: Department of Environmental Protection
Telephone: 860-424-3912
Last EDR Contact: 06/21/2006
Next Scheduled EDR Contact: 09/04/2006
Data Release Frequency: Varies

VCP: Voluntary Remediation Sites

Sites involved in the Voluntary Remediation Program.

Date of Government Version: 05/19/2006
Date Data Arrived at EDR: 05/19/2006
Date Made Active in Reports: 06/28/2006
Number of Days to Update: 40

Source: Department of Environmental Protection
Telephone: 860-424-3705
Last EDR Contact: 05/19/2006
Next Scheduled EDR Contact: 07/31/2006
Data Release Frequency: Varies

DRYCLEANERS: Drycleaner Facilities

A listing of drycleaner facility locations.

Date of Government Version: 01/18/2006
Date Data Arrived at EDR: 02/10/2006
Date Made Active in Reports: 03/14/2006
Number of Days to Update: 32

Source: Department of Environmental Protection
Telephone: 860-424-3026
Last EDR Contact: 07/10/2006
Next Scheduled EDR Contact: 10/09/2006
Data Release Frequency: Varies

BROWNFIELDS: Brownfields Inventory

Date of Government Version: 04/13/2006
Date Data Arrived at EDR: 04/14/2006
Date Made Active in Reports: 05/01/2006
Number of Days to Update: 17

Source: Connecticut Brownfields Redevelopment Authority
Telephone: 860-258-7833
Last EDR Contact: 04/14/2006
Next Scheduled EDR Contact: 07/17/2006
Data Release Frequency: Varies

ENFORCEMENT: Enforcement Case Listing

The types of enforcement actions included are administrative consent orders, final unilateral orders and final dispositions of civil cases through the Attorney General's Office.

Date of Government Version: 04/30/2006
Date Data Arrived at EDR: 06/01/2006
Date Made Active in Reports: 06/28/2006
Number of Days to Update: 27

Source: Department of Environmental Protection
Telephone: 860-424-3265
Last EDR Contact: 05/30/2006
Next Scheduled EDR Contact: 08/14/2006
Data Release Frequency: Varies

CT PROPERTY: Property Transfer Filings

A listing of sites that meet the definition of a hazardous waste establishment. They can be generators, dry cleaners, furniture strippers, etc. These sites have been sold to another owner.

Date of Government Version: 05/19/2006
Date Data Arrived at EDR: 05/19/2006
Date Made Active in Reports: 06/28/2006
Number of Days to Update: 40

Source: Department of Environmental Protection
Telephone: 860-424-3789
Last EDR Contact: 05/19/2006
Next Scheduled EDR Contact: 07/31/2006
Data Release Frequency: Semi-Annually

TRIBAL RECORDS

INDIAN RESERV: Indian Reservations

This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2004
Date Data Arrived at EDR: 02/08/2005
Date Made Active in Reports: 08/04/2005
Number of Days to Update: 177

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 05/12/2006
Next Scheduled EDR Contact: 08/07/2006
Data Release Frequency: Semi-Annually

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land

A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 06/08/2006	Source: EPA, Region 1
Date Data Arrived at EDR: 06/09/2006	Telephone: 617-918-1313
Date Made Active in Reports: 06/28/2006	Last EDR Contact: 05/24/2006
Number of Days to Update: 19	Next Scheduled EDR Contact: 08/28/2006
	Data Release Frequency: Varies

INDIAN UST R1: Underground Storage Tanks on Indian Land
A listing of underground storage tank locations on Indian Land.

Date of Government Version: 06/08/2006	Source: EPA, Region 1
Date Data Arrived at EDR: 06/09/2006	Telephone: 617-918-1313
Date Made Active in Reports: 06/28/2006	Last EDR Contact: 05/24/2006
Number of Days to Update: 19	Next Scheduled EDR Contact: 08/28/2006
	Data Release Frequency: Varies

EDR PROPRIETARY RECORDS

Manufactured Gas Plants: EDR Proprietary Manufactured Gas Plants
The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

Date of Government Version: N/A	Source: EDR, Inc.
Date Data Arrived at EDR: N/A	Telephone: N/A
Date Made Active in Reports: N/A	Last EDR Contact: N/A
Number of Days to Update: N/A	Next Scheduled EDR Contact: N/A
	Data Release Frequency: No Update Planned

EDR Historical Auto Stations: EDR Proprietary Historic Gas Stations
EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc.

Date of Government Version: N/A	Source: EDR, Inc.
Date Data Arrived at EDR: N/A	Telephone: N/A
Date Made Active in Reports: N/A	Last EDR Contact: N/A
Number of Days to Update: N/A	Next Scheduled EDR Contact: N/A
	Data Release Frequency: Varies

EDR Historical Cleaners: EDR Proprietary Historic Dry Cleaners
EDR has searched selected national collections of business directories and has collected listings of potential dry cleaner sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include dry cleaning establishments. The categories reviewed included, but were not limited to dry cleaners, cleaners, laundry, laundromat, cleaning/laundry, wash & dry etc.

Date of Government Version: N/A	Source: EDR, Inc.
Date Data Arrived at EDR: N/A	Telephone: N/A
Date Made Active in Reports: N/A	Last EDR Contact: N/A
Number of Days to Update: N/A	Next Scheduled EDR Contact: N/A
	Data Release Frequency: Varies

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

NJ MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2004
Date Data Arrived at EDR: 04/24/2006
Date Made Active in Reports: 05/02/2006
Number of Days to Update: 8

Source: Department of Environmental Protection
Telephone: N/A
Last EDR Contact: 07/05/2006
Next Scheduled EDR Contact: 10/02/2006
Data Release Frequency: Annually

NY MANIFEST: Facility and Manifest Data
Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a TSD facility.

Date of Government Version: 05/02/2006
Date Data Arrived at EDR: 05/31/2006
Date Made Active in Reports: 06/27/2006
Number of Days to Update: 27

Source: Department of Environmental Conservation
Telephone: 518-402-8651
Last EDR Contact: 05/31/2006
Next Scheduled EDR Contact: 08/28/2006
Data Release Frequency: Annually

PA MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 05/04/2006
Date Made Active in Reports: 06/06/2006
Number of Days to Update: 33

Source: Department of Environmental Protection
Telephone: N/A
Last EDR Contact: 06/12/2006
Next Scheduled EDR Contact: 09/11/2006
Data Release Frequency: Annually

RI MANIFEST: Manifest information
Hazardous waste manifest information

Date of Government Version: 09/30/2005
Date Data Arrived at EDR: 05/09/2006
Date Made Active in Reports: 05/24/2006
Number of Days to Update: 15

Source: Department of Environmental Management
Telephone: 401-222-2797
Last EDR Contact: 06/19/2006
Next Scheduled EDR Contact: 09/18/2006
Data Release Frequency: Annually

VT MANIFEST: Hazardous Waste Manifest Data
Hazardous waste manifest information.

Date of Government Version: 12/31/2004
Date Data Arrived at EDR: 03/17/2006
Date Made Active in Reports: 05/17/2006
Number of Days to Update: 61

Source: Department of Environmental Conservation
Telephone: 802-241-3443
Last EDR Contact: 05/15/2006
Next Scheduled EDR Contact: 08/14/2006
Data Release Frequency: Annually

WI MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 03/17/2006
Date Made Active in Reports: 05/02/2006
Number of Days to Update: 46

Source: Department of Natural Resources
Telephone: N/A
Last EDR Contact: 07/11/2006
Next Scheduled EDR Contact: 10/09/2006
Data Release Frequency: Annually

Oil/Gas Pipelines: This data was obtained by EDR from the USGS in 1994. It is referred to by USGS as GeoData Digital Line Graphs from 1:100,000-Scale Maps. It was extracted from the transportation category including some oil, but primarily gas pipelines.

Electric Power Transmission Line Data
Source: PennWell Corporation
Telephone: (800) 823-6277
This map includes information copyrighted by PennWell Corporation. This information is provided on a best effort basis and PennWell Corporation does not guarantee its accuracy nor warrant its fitness for any particular purpose. Such information has been reprinted with the permission of PennWell.

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:
Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing
Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.

Daycare Centers: Licensed Child Care Facilities
Source: Department of Public Health
Telephone: 860-509-8045

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 1999 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002 and 2005 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetland Soils
Source: Department of Environmental Protection
Telephone: 860-871-4047

Scanned Digital USGS 7.5' Topographic Map (DRG)
Source: United States Geologic Survey
A digital raster graphic (DRG) is a scanned image of a U.S. Geological Survey topographic map. The map images are made by scanning published paper maps on high-resolution scanners. The raster image is georeferenced and fit to the Universal Transverse Mercator (UTM) projection.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

STREET AND ADDRESS INFORMATION

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GEOCHECK ®- PHYSICAL SETTING SOURCE ADDENDUM

TARGET PROPERTY ADDRESS

MIDDLETOWN USARC, CT
499 MILE LANE
MIDDLETOWN, CT 06457

TARGET PROPERTY COORDINATES

Latitude (North):	41.58190 - 41˚ 34' 54.8''
Longitude (West):	72.6926 - 72˚ 41' 33.3''
Universal Tranverse Mercator:	Zone 18
UTM X (Meters):	692350.7
UTM Y (Meters):	4605715.0
Elevation:	103 ft. above sea level

USGS TOPOGRAPHIC MAP

Target Property Map:	41072-E6 MIDDLETOWN, CT
Most Recent Revision:	1992

EDR's GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

Assessment of the impact of contaminant migration generally has two principle investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

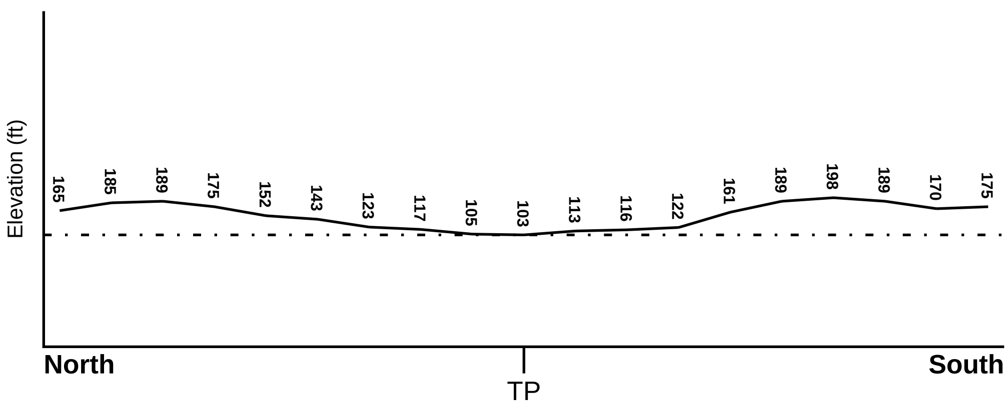
TOPOGRAPHIC INFORMATION

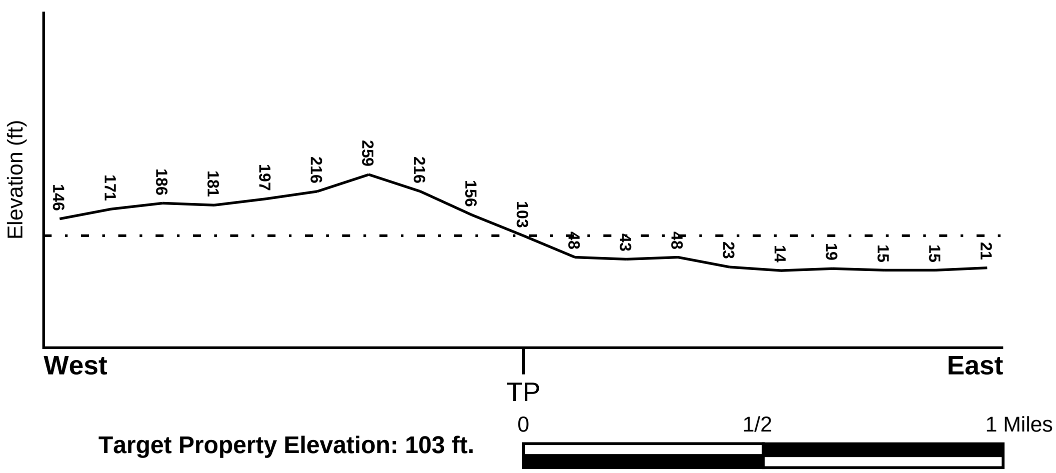
Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY

General Topographic Gradient: General East

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES





Target Property Elevation: 103 ft.

Source: Topography has been determined from the USGS 7.5' Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

HYDROLOGIC INFORMATION

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

FEMA FLOOD ZONE

Target Property County	FEMA Flood Electronic Data
MIDDLESEX, CT	YES - refer to the Overview Map and Detail Map

Flood Plain Panel at Target Property: 0900680002B

Additional Panels in search area: 0900680007B
0900680003B
0900680008B

NATIONAL WETLAND INVENTORY

NWI Quad at Target Property	NWI Electronic Data Coverage
MIDDLETOWN	YES - refer to the Overview Map and Detail Map

HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Site-Specific Hydrogeological Data*:

Search Radius: 1.25 miles
Status: Not found

AQUIFLOW®

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

MAP ID	LOCATION FROM TP	GENERAL DIRECTION GROUNDWATER FLOW
Not Reported		

* ©1996 Site−specific hydrogeological data gathered by CERCLIS Alerts, Inc., Bainbridge Island, WA. All rights reserved. All of the information and opinions presented are those of the cited EPA report(s), which were completed under a Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) investigation.

GROUNDWATER FLOW VELOCITY INFORMATION

Groundwater flow velocity information for a particular site is best determined by a qualified environmental professional using site specific geologic and soil strata data. If such data are not reasonably ascertainable, it may be necessary to rely on other sources of information, including geologic age identification, rock stratigraphic unit and soil characteristics data collected on nearby properties and regional soil information. In general, contaminant plumes move more quickly through sandy-gravelly types of soils than silty-clayey types of soils.

GEOLOGIC INFORMATION IN GENERAL AREA OF TARGET PROPERTY

Geologic information can be used by the environmental professional in forming an opinion about the relative speed at which contaminant migration may be occurring.

ROCK STRATIGRAPHIC UNIT

Era: Mesozoic
System: Triassic
Series: Triassic
Code: Tr *(decoded above as Era, System & Series)*

GEOLOGIC AGE IDENTIFICATION

Category: Stratified Sequence

Geologic Age and Rock Stratigraphic Unit Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - a digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

DOMINANT SOIL COMPOSITION IN GENERAL AREA OF TARGET PROPERTY

The U.S. Department of Agriculture’s (USDA) Soil Conservation Service (SCS) leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps. The following information is based on Soil Conservation Service STATSGO data.

Soil Component Name: WETHERSFIELD

Soil Surface Texture: loam

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Well drained. Soils have intermediate water holding capacity. Depth to water table is more than 6 feet.

Hydric Status: Soil does not meet the requirements for a hydric soil.

Corrosion Potential - Uncoated Steel: LOW

Depth to Bedrock Min: > 60 inches

Depth to Bedrock Max: > 60 inches

Soil Layer Information							
	Boundary			Classification			
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil	Permeability Rate (in/hr)	Soil Reaction (pH)
1	0 inches	8 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 2.00 Min: 0.60	Max: 6.00 Min: 4.50
2	8 inches	26 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 2.00 Min: 0.60	Max: 6.00 Min: 4.50
3	26 inches	65 inches	gravelly - loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 0.20 Min: 0.00	Max: 6.00 Min: 4.50

OTHER SOIL TYPES IN AREA

Based on Soil Conservation Service STATSGO data, the following additional subordinant soil types may appear within the general area of target property.

Soil Surface Textures: very stony - loam
very stony - silt loam
silt loam
gravelly - sandy loam
fine sandy loam
very stony - fine sandy loam

Surficial Soil Types: very stony - loam
very stony - silt loam
silt loam
gravelly - sandy loam
fine sandy loam
very stony - fine sandy loam

Shallow Soil Types: No Other Soil Types

Deeper Soil Types: loam
stratified
unweathered bedrock
gravelly - sandy loam

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

LOCAL / REGIONAL WATER AGENCY RECORDS

EDR Local/Regional Water Agency records provide water well information to assist the environmental professional in assessing sources that may impact ground water flow direction, and in forming an opinion about the impact of contaminant migration on nearby drinking water wells.

WELL SEARCH DISTANCE INFORMATION

DATABASE	SEARCH DISTANCE (miles)
Federal USGS	1.000
Federal FRDS PWS	Nearest PWS within 1 mile
State Database	1.000

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
1	USGS2098886	1/4 - 1/2 Mile North
2	USGS2098888	1/4 - 1/2 Mile North
3	USGS2098899	1/2 - 1 Mile NNW
4	USGS2098902	1/2 - 1 Mile North
5	USGS2099080	1/2 - 1 Mile South

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

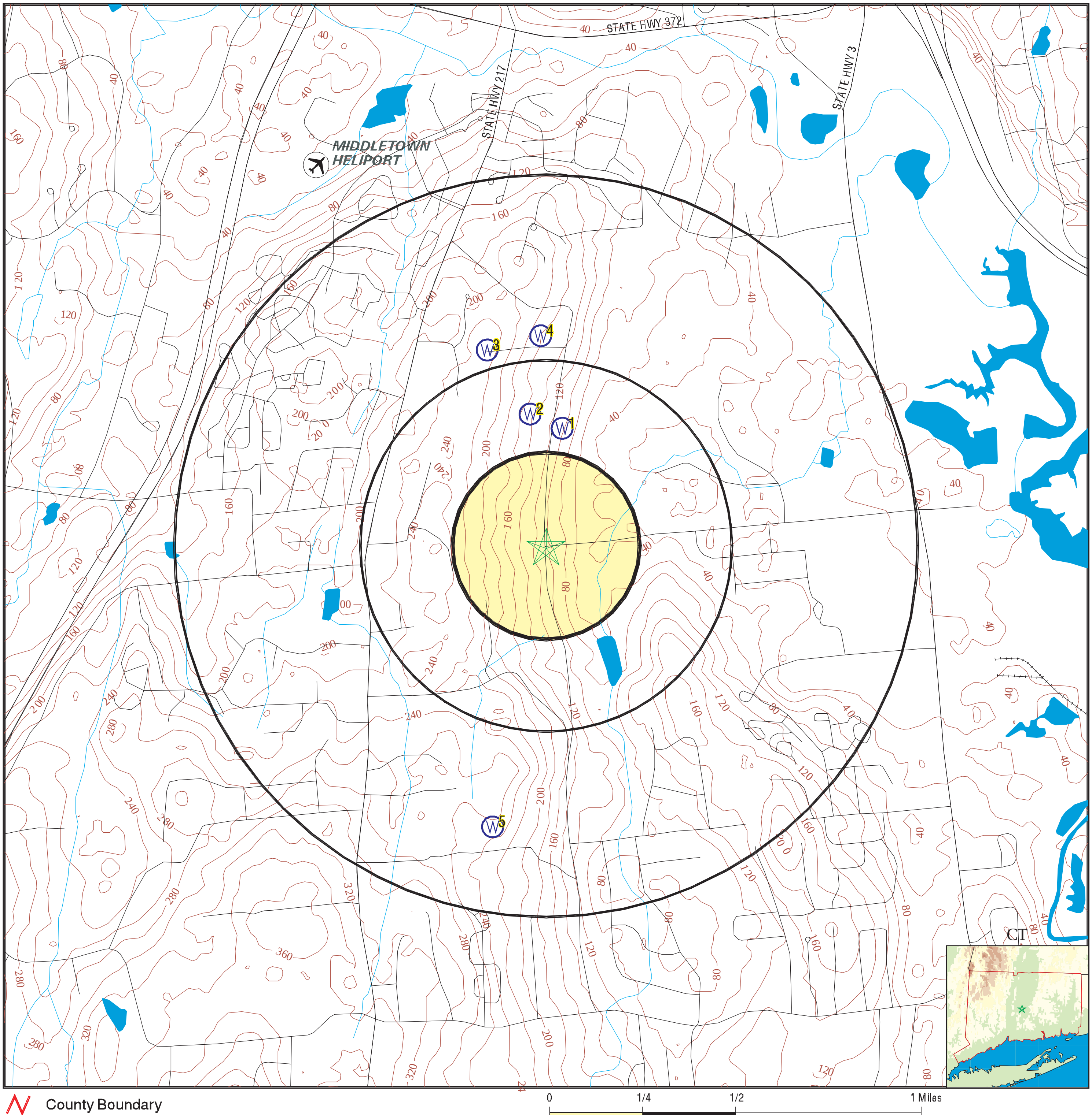
MAP ID	WELL ID	LOCATION FROM TP
No PWS System Found		

Note: PWS System location is not always the same as well location.

STATE DATABASE WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No Wells Found		

PHYSICAL SETTING SOURCE MAP - 01714247.182r



County Boundary
Major Roads
Contour Lines
Airports
Earthquake epicenter, Richter 5 or greater
Water Wells
Public Water Supply Wells
Cluster of Multiple Icons

Groundwater Flow Direction
Indeterminate Groundwater Flow at Location
Groundwater Flow Varies at Location
Closest Hydrogeological Data

EPA Designated Sole Src. Aq.

SITE NAME:	Middletown USARC, CT	CLIENT:	CH2M Hill
ADDRESS:	499 MILE LANE	CONTACT:	Mary Beth Jacques
	MIDDLETOWN CT 06457	INQUIRY #:	01714247.182r
LAT/LONG:	41.5819 / 72.6926	DATE:	July 13, 2006

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Map ID
Direction
Distance
Elevation | Database | EDR ID Number

1
North
1/4 - 1/2 Mile
Higher

FED USGS **USGS2098886**

Agency cd:	USGS	Site no:	413511072413201
Site name:	CT-MT 371		
Latitude:	413511		
Longitude:	0724132	Dec lat:	41.58648778
Dec lon:	-72.6917611	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	09
State:	09	County:	007
Country:	US	Land net:	Not Reported
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	110.00	Altitude method:	M
Altitude accuracy:	5.	Altitude datum:	NGVD29
Hydrologic:	Lower Connecticut. Connecticut, Massachusetts. Area = 1090 sq.mi.		
Topographic:	Hillside (slope)		
Site type:	Ground-water other than Spring	Date construction:	1965
Date inventoried:	Not Reported	Mean greenwich time offset:	EST
Local standard time flag:	N		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	70.0	Hole depth:	Not Reported
Source of depth data:	Not Reported	Project number:	Not Reported
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1965-04-01	Ground water data end date:	1965-04-01
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1965-04-01	25.00	

2
North
1/4 - 1/2 Mile
Higher

FED USGS **USGS2098888**

Agency cd:	USGS	Site no:	413513072413801
Site name:	CT-MT 8		
Latitude:	413513		
Longitude:	0724138	Dec lat:	41.5870433
Dec lon:	-72.693428	Coor meth:	M
Coor accr:	F	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	09
State:	09	County:	007
Country:	US	Land net:	Not Reported
Location map:	Not Reported	Map scale:	Not Reported

Altitude:	130.00	Altitude method:	M
Altitude accuracy:	10	Altitude datum:	NGVD29
Hydrologic:	Lower Connecticut. Connecticut, Massachusetts. Area = 1090 sq.mi.		
Topographic:	Hillside (slope)		
Site type:	Ground-water other than Spring	Date construction:	1926
Date inventoried:	Not Reported	Mean greenwich time offset:	EST
Local standard time flag:	N		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	49.0	Hole depth:	Not Reported
Source of depth data:	Not Reported	Project number:	Not Reported
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1926-01-01	Ground water data end date:	1926-01-01
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1926-01-01		

Note: The site was flowing, but the head could not be measured without additional equipment.

3
NNW
1/2 - 1 Mile
Higher

FED USGS **USGS2098899**

Agency cd:	USGS	Site no:	413522072414601
Site name:	CT-MT 362		
Latitude:	413522		
Longitude:	0724146	Dec lat:	41.5895433
Dec lon:	-72.69565028	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	09
State:	09	County:	007
Country:	US	Land net:	Not Reported
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	230.00	Altitude method:	M
Altitude accuracy:	5.	Altitude datum:	NGVD29
Hydrologic:	Lower Connecticut. Connecticut, Massachusetts. Area = 1090 sq.mi.		
Topographic:	Hilltop		
Site type:	Ground-water other than Spring	Date construction:	1966
Date inventoried:	Not Reported	Mean greenwich time offset:	EST
Local standard time flag:	N		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	265	Hole depth:	Not Reported
Source of depth data:	Not Reported	Project number:	Not Reported
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00

Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1966-07-01	Ground water data end date:	1966-07-01
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1966-07-01	40.00	

4
North
1/2 - 1 Mile
Higher

FED USGS **USGS2098902**

Agency cd:	USGS	Site no:	413524072413601
Site name:	CT-MT 363		
Latitude:	413524		
Longitude:	0724136	Dec lat:	41.59009889
Dec lon:	-72.6928725	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	09
State:	09	County:	007
Country:	US	Land net:	Not Reported
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	140.00	Altitude method:	M
Altitude accuracy:	5.	Altitude datum:	NGVD29
Hydrologic:	Lower Connecticut. Connecticut, Massachusetts. Area = 1090 sq.mi.		
Topographic:	Hillside (slope)		
Site type:	Ground-water other than Spring	Date construction:	1965
Date inventoried:	Not Reported	Mean greenwich time offset:	EST
Local standard time flag:	N		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	IGNEOUS EXTRUSIVES		
Well depth:	100	Hole depth:	Not Reported
Source of depth data:	other	Project number:	Not Reported
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	1972-04-05
Water quality data end date:	1972-04-05	Water quality data count:	1
Ground water data begin date:	1965-05-01	Ground water data end date:	1965-05-01
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1965-05-01	20.00	

5
South
1/2 - 1 Mile
Higher

FED USGS **USGS2099080**

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Agency cd:	USGS	Site no:	413415072414501
Site name:	CT-MT 370		
Latitude:	413415		
Longitude:	0724145	Dec lat:	41.57093194
Dec lon:	-72.6953725	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	09
State:	09	County:	007
Country:	US	Land net:	Not Reported
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	265.00	Altitude method:	M
Altitude accuracy:	5.	Altitude datum:	NGVD29
Hydrologic:	Lower Connecticut. Connecticut, Massachusetts. Area = 1090 sq.mi.		
Topographic:	Hillside (slope)		
Site type:	Ground-water other than Spring	Date construction:	1966
Date inventoried:	Not Reported	Mean greenwich time offset:	EST
Local standard time flag:	N		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	565	Hole depth:	Not Reported
Source of depth data:	Not Reported	Project number:	Not Reported
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Daily flow data end date:	Not Reported	Daily flow data count:	Not Reported
Peak flow data begin date:	Not Reported	Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS
RADON

AREA RADON INFORMATION

State Database: CT Radon

Radon Test Results

City	Total Sites	< 4 Pci/L	4 < 10 Pci/L	10 < 20 Pci/L	20 < 50 Pci/L	50 < 100 Pci/L	> 100 Pci/L
Chester	3	2 (66.7)	1 (33.3)	0 (0)	0 (0)	0 (0)	0 (0)
Clinton	7	4 (57)	2 (28.6)	0 (0)	1 (14.3)	0 (0)	0 (0)
Cromwell	294	265 (90.1)	27 (9.2)	2 (.7)	0 (0)	0 (0)	0 (0)
Durham	10	3 (30)	3 (30)	4 (40)	0 (0)	0 (0)	0 (0)
East Haddam	5	0 (0)	2 (40)	3 (60)	0 (0)	0 (0)	0 (0)
East Hampton	110	83 (100)	19 (0)	8 (0)	0 (0)	0 (0)	0 (0)
Essex	14	6 (42.9)	7 (50)	1 (7.1)	0 (0)	0 (0)	0 (0)
Haddam	109	66 (60.5)	26 (23.9)	13 (11.9)	4 (3.7)	0 (0)	0 (0)
Ivoryton	4	2 (50)	2 (50)	0 (0)	0 (0)	0 (0)	0 (0)
Killingworth	14	10 (71.4)	2 (14.3)	2 (14.3)	0 (0)	0 (0)	0 (0)
Middle Haddam	1	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Middlefield	4	2 (50)	2 (50)	0 (0)	0 (0)	0 (0)	0 (0)
Middletown	348	272 (78.2)	55 (15.8)	15 (4.3)	6 (1.7)	0 (0)	0 (0)
Moodus	1	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Old Saybrook	28	24 (85.7)	3 (10.7)	1 (3.6)	0 (0)	0 (0)	0 (0)
Portland	110	94 (85.5)	10 (9.1)	3 (2.7)	2 (1.8)	1 (.9)	0 (0)
Rockfall	3	2 (66.7)	1 (33.3)	0 (0)	0 (0)	0 (0)	0 (0)
Westbrook	3	3 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Federal EPA Radon Zone for MIDDLESEX County: 1

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

Federal Area Radon Information for Zip Code: 06457

Number of sites tested: 11

Area	Average Activity	% <4 pCi/L	% 4-20 pCi/L	% >20 pCi/L
Living Area - 1st Floor	1.525 pCi/L	100%	0%	0%
Living Area - 2nd Floor	Not Reported	Not Reported	Not Reported	Not Reported
Basement	1.000 pCi/L	100%	0%	0%

PHYSICAL SETTING SOURCE RECORDS SEARCHED

TOPOGRAPHIC INFORMATION

USGS 7.5' Digital Elevation Model (DEM)
Source: United States Geologic Survey
EDR acquired the USGS 7.5' Digital Elevation Model in 2002 and updated it in 2006. The 7.5 minute DEM corresponds to the USGS 1:24,000- and 1:25,000-scale topographic quadrangle maps. The DEM provides elevation data with consistent elevation units and projection.

Scanned Digital USGS 7.5' Topographic Map (DRG)
Source: United States Geologic Survey
A digital raster graphic (DRG) is a scanned image of a U.S. Geological Survey topographic map. The map images are made by scanning published paper maps on high-resolution scanners. The raster image is georeferenced and fit to the Universal Transverse Mercator (UTM) projection.

HYDROLOGIC INFORMATION

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 1999 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002 and 2005 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetland Soils
Source: Department of Environmental Protection
Telephone: 860-871-4047

HYDROGEOLOGIC INFORMATION

AQUIFLOW[R] Information System
Source: EDR proprietary database of groundwater flow information
EDR has developed the AQUIFLOW Information System (AIS) to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted to regulatory authorities at select sites and has extracted the date of the report, hydrogeologically determined groundwater flow direction and depth to water table information.

GEOLOGIC INFORMATION

Geologic Age and Rock Stratigraphic Unit
Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

STATSGO: State Soil Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Services
The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) leads the national Conservation Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps.

SSURGO: Soil Survey Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Services (NRCS)
Telephone: 800-672-5559
SSURGO is the most detailed level of mapping done by the Natural Resources Conservation Services, mapping scales generally range from 1:12,000 to 1:63,360. Field mapping methods using national standards are used to construct the soil maps in the Soil Survey Geographic (SSURGO) database. SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships and county natural resource planning and management.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

LOCAL / REGIONAL WATER AGENCY RECORDS

FEDERAL WATER WELLS

PWS: Public Water Systems
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

USGS Water Wells: USGS National Water Inventory System (NWIS)
This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on wells, springs, and other sources of groundwater.

STATE RECORDS

Connecticut Leachate and Wastewater Discharge Sites
Source: Department of Environmental Protection
The Leachate and Waste Water Discharge Inventory Data Layer (LWDS) includes point locations digitized from Leachate and Wastewater Discharge Source maps compiled by the Connecticut DEP. These maps locate surface and groundwater discharges that (1) have received a waste water discharge permit from the state or (2) are historic and now defunct waste sites or (3) are locations of accidental spills, leaks, or discharges of a variety of liquid or solid wastes.

EPA-Approved Sole Source Aquifers in Connecticut
Source: EPA
Sole source aquifers are defined as an aquifer designated as the sole or principal source of drinking water for a given aquifer service area; that is, an aquifer which is needed to supply 50% or more of the drinking water for the area and for which there are no reasonable alternative sources should the aquifer become contaminated.

Community and Non-Community Water System Wells
Source: Department of Public Health, Water Supplies Section
Telephone: 860-509-7333
Active, emergency and inactive wells used for potable purposes that are owned and operated by active community and non-community water systems in Connecticut.

OTHER STATE DATABASE INFORMATION

RADON

State Database: CT Radon
Source: Department of Public Health
Telephone: 860-509-7367
Radon Statistical Summary

Area Radon Information
Source: USGS
Telephone: 703-356-4020
The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

EPA Radon Zones
Source: EPA
Telephone: 703-356-4020
Sections 307 & 309 of IRAA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

OTHER

Airport Landing Facilities: Private and public use landing facilities
Source: Federal Aviation Administration, 800-457-6656

Epicenters: World earthquake epicenters, Richter 5 or greater
Source: Department of Commerce, National Oceanic and Atmospheric Administration

STREET AND ADDRESS INFORMATION

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Fax To: CH2M Hill
Contact: Mary Beth Jacques
Fax : 404-229-9152
Date: 07/13/2006

Fax From: Bart Sobieralski
EDR
Phone: 1-800-352-0050

EDR PUR-IQ® Report

"the intelligent way to conduct historical research"

for
Middletown USARC, CT
499 MILE LANE
MIDDLETOWN, CT 06457
Lat./Long. 41.58190 / 72.69260
EDR Inquiry # 01714247.182r

The EDR PUR-IQ report facilitates historical research planning required to complete the Phase I ESA process. The report identifies the *likelihood* of prior use coverage by searching proprietary EDR-Prior Use Reports® comprising nationwide information on: city directories, fire insurance maps, aerial photographs, historical topographic maps, flood maps and National Wetland Inventory maps.

Potential for EDR Historical (Prior Use) Coverage - Coverage in the following historical information sources may be used as a guide to develop your historical research strategy:

1. **City Directory:** Coverage may exist for portions of Middlesex County, CT.
2. **Fire Insurance Map:** When you order online any EDR Package or the EDR Radius Map with EDR Sanborn Map Search/Print, you receive site specific Sanborn Map coverage information at no charge.
3. **Aerial Photograph:** Aerial photography coverage may exist for portions of Middlesex County. Please contact your EDR Account Executive for information about USGS photos available through EDR.
4. **Topographic Map:** The USGS 7.5 min. quad topo sheet(s) associated with this site:

   Historical: Coverage exists for Middlesex County

   Current: Target Property: TP **|** 1992 **|** 41072-E6 Middletown, CT

EDR's network of professional researchers, located throughout the United States, accesses the most extensive national collections of city directory, fire insurance maps, aerial photographs and historical topographic map resources available for MIDDLETOWN, CT. These collections may be located in multiple libraries throughout the country. To ensure maximum coverage, EDR will often assign researchers at these multiple locations on your behalf. Please call or fax your EDR representative to authorize a search.

EDR - HISTORICAL SOURCE(S) ORDER FORM

CH2M Hill
Mary Beth Jacques
Account # 1592163

Middletown USARC, CT
499 MILE LANE
MIDDLETOWN, CT 06457
Middlesex County
Lat./Long. 41.58190 / 72.69260
EDR Inquiry # 01714247.182r

Should you wish to change or add to your order, fax this form to your EDR account executive:

Bart Sobieralski
Ph: 1-800-352-0050 Fax: 1-800-231-6802

Reports

___ EDR Sanborn Map® Search/Print

___ EDR Fire Insurance Map Abstract

___ EDR Multi-Tenant Retail Facility® Report

___ EDR City Directory Abstract

___ EDR Aerial Photo Decade Package

___ USGS Aerial 5 Package

___ USGS Aerial 3 Package

___ EDR Historical Topographic Maps

___ Paper Current USGS Topo (7.5 min.)

___ Environmental Lien Search

___ Chain of Title Search

___ NJ MacRaes Industrial Directory Report

___ EDR Telephone Interview

Shipping:

RUSH SERVICE IS AVAILABLE

___ Email
___ Express, Next Day Delivery
___ Express, Second Day Delivery
___ Express, Next day Delivery Customer Account Acct # ________________
___ Express, Second Day Delivery Customer Account Acct # ________________
___ U.S. Mail

Thank you

EDR® Environmental Data Resources Inc

"Linking Technology with Tradition"®

Sanborn® Map Report

Ship To: Mary Beth Jacques
CH2M Hill
1569 Stampmill Way
Lawrenceville, GA 30043

Order Date: 7/12/2006 **Completion Date:** 7/12/2006
Inquiry #: 1714247.183
P.O. #: NA
Site Name: Middletown USARC, CT
Address: 499 MILE LANE
City/State: MIDDLETOWN, CT 06457
Cross Streets:

Customer Project: NA
1592163BAS 770-338-1589

This document reports that the largest and most complete collection of Sanborn fire insurance maps has been reviewed based on client supplied information, and fire insurance maps depicting the target property at the specified address were not identified.

NO COVERAGE

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The EDR Aerial Photo Decade Package

Middletown USARC, CT
499 MILE LANE
MIDDLETOWN, CT 06457

Inquiry Number: 1714247.185

July 13, 2006

EDR® Environmental
Data Resources Inc

The Standard in Environmental Risk Management Information

440 Wheelers Farms Road
Milford, Connecticut 06461

Nationwide Customer Service

Telephone:	1-800-352-0050
Fax:	1-800-231-6802
Internet:	www.edrnet.com

EDR Aerial Photo Decade Package

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDRs professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

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Date EDR Searched Historical Sources:

Aerial Photography July 13, 2006

Target Property:

499 MILE LANE
MIDDLETOWN, CT 06457

Year	***Scale***	***Details***	***Source***
1989	Aerial Photograph. Scale: 1"=750'	Panel #: 2441072-E6/Flight Date: June 01, 1989	EDR
1995	Aerial Photograph. Scale: 1"=833'	Panel #: 2441072-E6/Flight Date: April 25, 1995	EDR

INQUIRY #: 1714247.185

YEAR: 1989

= 750'

N

EDR Environmental Data Resources Inc

INQUIRY #: 1714247.185

YEAR: 1995

= 833'

N

EDR Environmental Data Resources Inc

The EDR-City Directory
Abstract

Middletown USARC, CT
499 MILE LANE
MIDDLETOWN, CT 06457

Inquiry Number: 1714247.186

Monday, July 24, 2006

EDR® Environmental Data Resources Inc

The Standard in Environmental Risk Management Information

440 Wheelers Farms Road
Milford, Connecticut 06461

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

EDR City Directory Abstract

Environmental Data Resources, Inc.'s (EDR) City Directory Abstract is a screening report designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's City Directory Abstract includes a search and abstract of available city directory data. For each address, the directory lists the name of the corresponding occupant at five year intervals.

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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SUMMARY

- ***City Directories:***

Business directories including city, cross reference and telephone directories were reviewed, if available, at approximately five year intervals for the years spanning 1965 through 2005. (These years are not necessarily inclusive.) A summary of the information obtained is provided in the text of this report.

Date EDR Searched Historical Sources: July 24, 2006

Target Property:
499 MILE LANE
MIDDLETOWN, CT 06457

Year	***Uses***	***Source***
1965	Address Not Listed in Research Source	Price & Lee's City Directory
1970	Address Not Listed in Research Source	Price & Lee's City Directory
1975	Address Not Listed in Research Source	Price & Lee's City Directory
1986	Address Not Listed in Research Source	Johnson's City Directory
1990	Address Not Listed in Research Source	Johnson's City Directory
2002	Street Not Listed in Research Source	Cole Criss-Cross Directory
2005	Street Not Listed in Research Source	Cole Criss-Cross Directory

Adjoining Properties

SURROUNDING

Multiple Addresses
MIDDLETOWN, CT 06457

Year	***Uses***	***Source***
1965	****Mile Lane****	Price & Lee's City Directory
	Residence (448)	Price & Lee's City Directory
	Residence (458)	Price & Lee's City Directory
	Residence (468)	Price & Lee's City Directory
	No other addresses in range	Price & Lee's City Directory
1970	****Mile Lane****	Price & Lee's City Directory
	Residence (448)	Price & Lee's City Directory
	Residence (458)	Price & Lee's City Directory
	Residence (468)	Price & Lee's City Directory

Year	*Uses*	*Source*
1970	No other addresses in range	Price & Lee's City Directory
1975	**__**Mile Lane**__**	Price & Lee's City Directory
	Residence (448)	Price & Lee's City Directory
	Residence (458)	Price & Lee's City Directory
	Residence (468)	Price & Lee's City Directory
	No other addresses in range	Price & Lee's City Directory
1986	**__**Mile Lane**__**	Johnson's City Directory
	Residence (448)	Johnson's City Directory
	Residence (458)	Johnson's City Directory
	Residence (468)	Johnson's City Directory
	No other addresses in range	Johnson's City Directory
1990	**__**Mile Lane**__**	Johnson's City Directory
	Residence (448)	Johnson's City Directory
	Residence (458)	Johnson's City Directory
	Residence (468)	Johnson's City Directory
	No other addresses in range	Johnson's City Directory
2002	Street Not Listed in Research Source	Cole Criss-Cross Directory
2005	Street Not Listed in Research Source	Cole Criss-Cross Directory