FINAL
Site Inspection Report

Former Nike Site CL-48
FUDS Site #G05OH0052

Garfield Heights and Independence
Cuyahoga County, Ohio

Contract No. W912QR-04-D-0044
Delivery Order No. 0007

U.S. Army Corps of Engineers®
Louisville District

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24 November 2009

Final Site Inspection Report Distribution List

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Acronym List

ADR	automated data review
AOC	area of concern
ASTM	ASTM International
ATSDR	Agency for Toxic Substances and Disease Registry
BD/DR	building demolition/debris removal
bgs	below ground surface
BRA	baseline risk assessment
CEI	Cleveland Electric Illuminating Company
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CVNP	Cuyahoga Valley National Park
COC	chain-of-custody
COPC	constituent of potential concern
COPEC	chemical of potential ecological concern
CSM	conceptual site model
DoD	Department of Defense
DPT	direct-push technology
DQO	data quality objectives
DTW	depth to groundwater
DVR	Data Verification/Validation Report
Eco-SSL	ecological soil screening levels
EPARSL RS	U.S. Environmental Protection Agency regional screening levels for residential soil
EPARSL WG	United States Environmental Protection Agency regional screening levels for tap water
ERA	ecological risk assessment
ESV	ecological screening value
FUDS	Formerly Used Defense Site
ID	identification
IDW	investigation-derived waste
KRRA	Karl R. Rohrer & Associates
LAB	Launch Area background
LCG	Louisville Chemistry Guidelines
LCS	laboratory control sample
MCL	maximum contaminant level
MDL	method detection limit
MI	Multi Increment®
MQO	method quality objective
MRL	method reporting limit

Acronym List (continued)

MS %R	matrix spike percent recoveries
MS/MSD	matrix spike/matrix spike duplicate
MW	monitoring well
NFR	no further remediation
ng/m^3	nanograms per cubic meter
ODNR	Ohio Department of Natural Resources
Ohio EPA	Ohio Environmental Protection Agency
PA	Preliminary Assessment
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PID	photoionization detector
PPE	personal protective equipment
ppm	parts per million
PRG	preliminary remediation guideline
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RCRA	Resource Conservation and Recovery Act
RSL	regional screening level
SAP	Sampling and Analysis Plan
SB	soil boring
SLERA	screening level ecological risk assessment
SI	Site Inspection
SOW	scope of work
SVOC	semivolatile organic compound
TA	TestAmerica Laboratories, Inc.
TAL	target analyte list
TEJV	Terraine-EnSafe Joint Venture
TPH-GRO	total petroleum hydrocarbons-gasoline range organics
UCL	upper confidence level
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
U.S.	United States
UST	underground storage tank
VOC	volatile organic compound
WP	Work Plan

1.0 INTRODUCTION

The Terraine-EnSafe Joint Venture (TEJV) was authorized by the U.S. Army Corps of Engineers (USACE) Louisville District to perform a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Site Inspection (SI) of the former Nike Site CL-48 (the "Site"). The Site is in Cuyahoga County, south of Cleveland, Ohio, and is designated as Formerly Used Defense Site (FUDS) number G05OH0052. The work is being performed under Contract Number W912QR-04-D-0044, Delivery Order No. 0007.

A Preliminary Assessment (PA; TEJV, 2007) of the former Nike Site CL-48 identified areas of concern (AOCs) within the former Nike Site CL-48 Launch and Control Areas. The PA recommended an SI to assess whether the AOCs resulted in any impact to the Site.

This SI Report was prepared in general conformance with guidance contained in the USACE documents *Guidance for Performing Site Inspections Under CERCLA*, September 1992 and *Federal Facilities Remedial Site Inspection Summary Guide*, 21 July 2005. In addition to on-site data collected during the SI, information provided in previously submitted reports and planning documents was used in the preparation of this SI Report.

1.1 Purpose

The purpose of the SI is to determine whether hazardous substances are present in concentrations that potentially pose a risk to human health and the environment due to past Department of Defense (DoD) use of the property. Data and other information obtained via SI activities are used to determine the need for additional SI activities, including additional characterization necessary for a human health baseline risk assessment (BRA), screening level ecological risk assessment (SLERA), removal action, other remedial projects, or a determination of No Further Remediation (NFR).

1.2 Location

As shown in Figure 1-1, the former Nike Site CL-48 is comprised of two areas, the Control Area and the Launch Area. The approximately 15.41-acre former Control Area, located at 5640 Briarcliff Drive in Garfield Heights, is split into two parcels; approximately 5 acres are owned by the Garfield Heights Board of Education, and approximately 10 acres are owned by Garfield Office Development, LLC. The SI study area is within the property owned by the Garfield Heights Board of Education. The property is west of Briarcliff Drive at a latitude and longitude of 41° 24' 33.1'' north by 81° 36' 32.0'' west. The former Control Area can be reached by exiting Turney Road west onto Darlington Road, traveling north on Cumberland Road, and traveling west on Briarcliff Drive to the property.

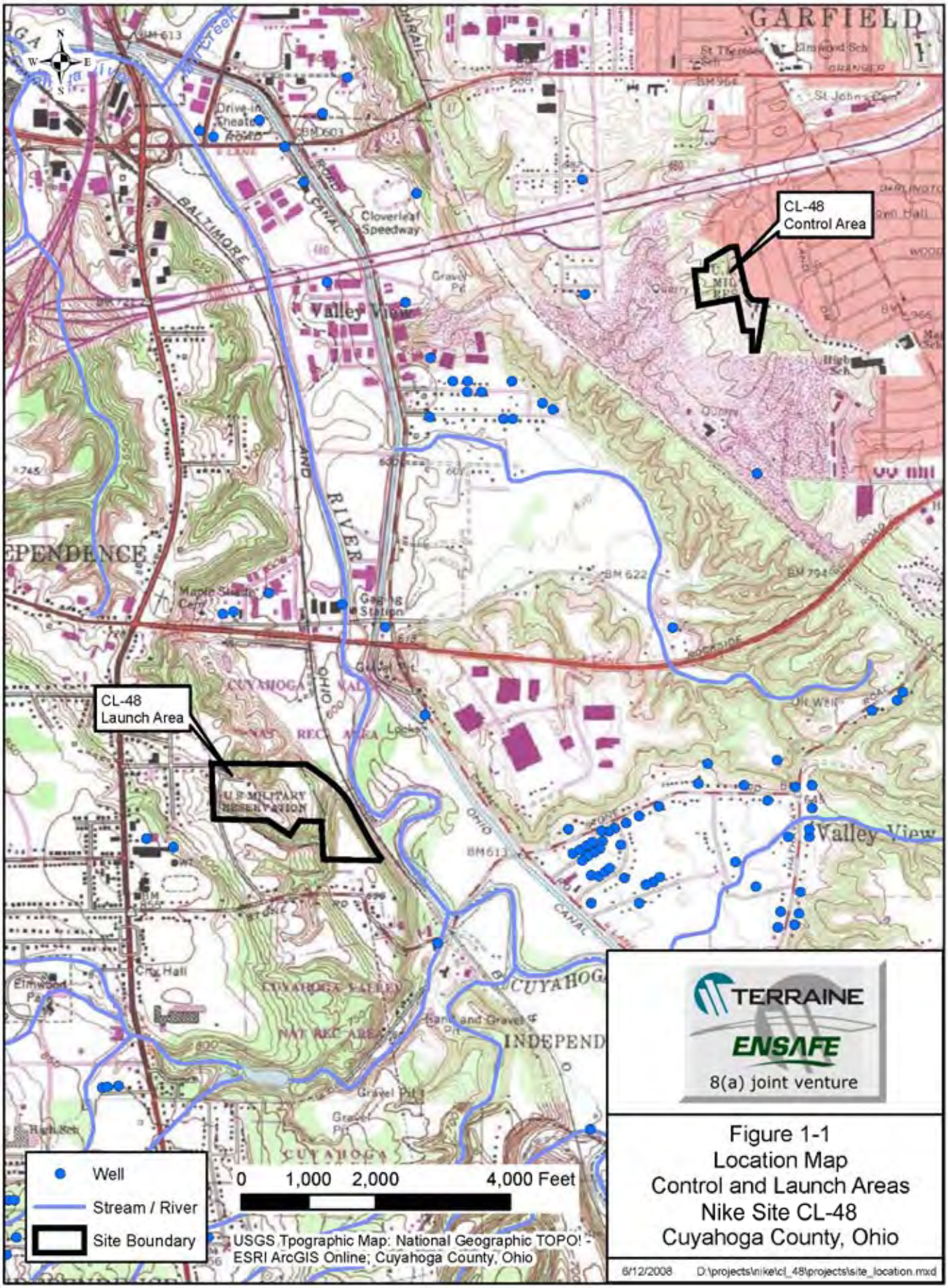


Figure 1-1
Location Map
Control and Launch Areas
Nike Site CL-48
Cuyahoga County, Ohio

The approximately 49.22-acre former Launch Area is at 7733 Stone Road in Independence and is owned by the Independence Board of Education. The property is east of Brecksville Road and west of the Cuyahoga River. The latitude and longitude of the former Launch Area is 41° 23' 13.9'' north by 81° 38' 1.7'' west. The former Launch Area can be reached by exiting Brecksville Road onto Stone Road (east) and then traveling south on Tulip Trail to the property. Tulip Trail follows a former site access easement.

1.3 Site Description and Surrounding Land Use

The SI study area consists of two separate parcels located approximately 1.7 miles apart. The study area at the former Control Area in Garfield Heights is approximately 1 acre and is occupied by the Garfield Heights City Schools offices. Several of the former Nike buildings are used as office space and educational facilities. The southern portion of the property was once used as a community garden. Residential areas are north and east of the property. The Boyas Landfill is to the west, and a wooded area is adjacent to the southeast. Areas to the south are currently in the process of development.

The study area at the former Launch Area in Independence is approximately 15 acres. This area is occupied by the Independence School District offices and bus transportation facility. Several of the former Nike buildings are used as school district offices and bus maintenance facilities. The developed area is surrounded by wooded hill slopes. Wooded areas surrounding the Launch Area are used by the school district as an environmental studies land lab for students. The north and east portions of the property are used as an outdoor education center with trails, gardens, two man-made ponds, and a pavilion. The former Launch Area is bound on three sides — north, south, and east — by the Cuyahoga Valley National Park (CVNP). Areas west and south are residential.

Figures 1-2 and 1-3 are aerial photographs from 1960 showing the former Nike Site CL-48 Control and Launch Areas, respectively, when they were active. Figures 1-4 and 1-5 are 2000 aerial photographs of the Control and Launch Areas, respectively, showing more recent Site conditions.

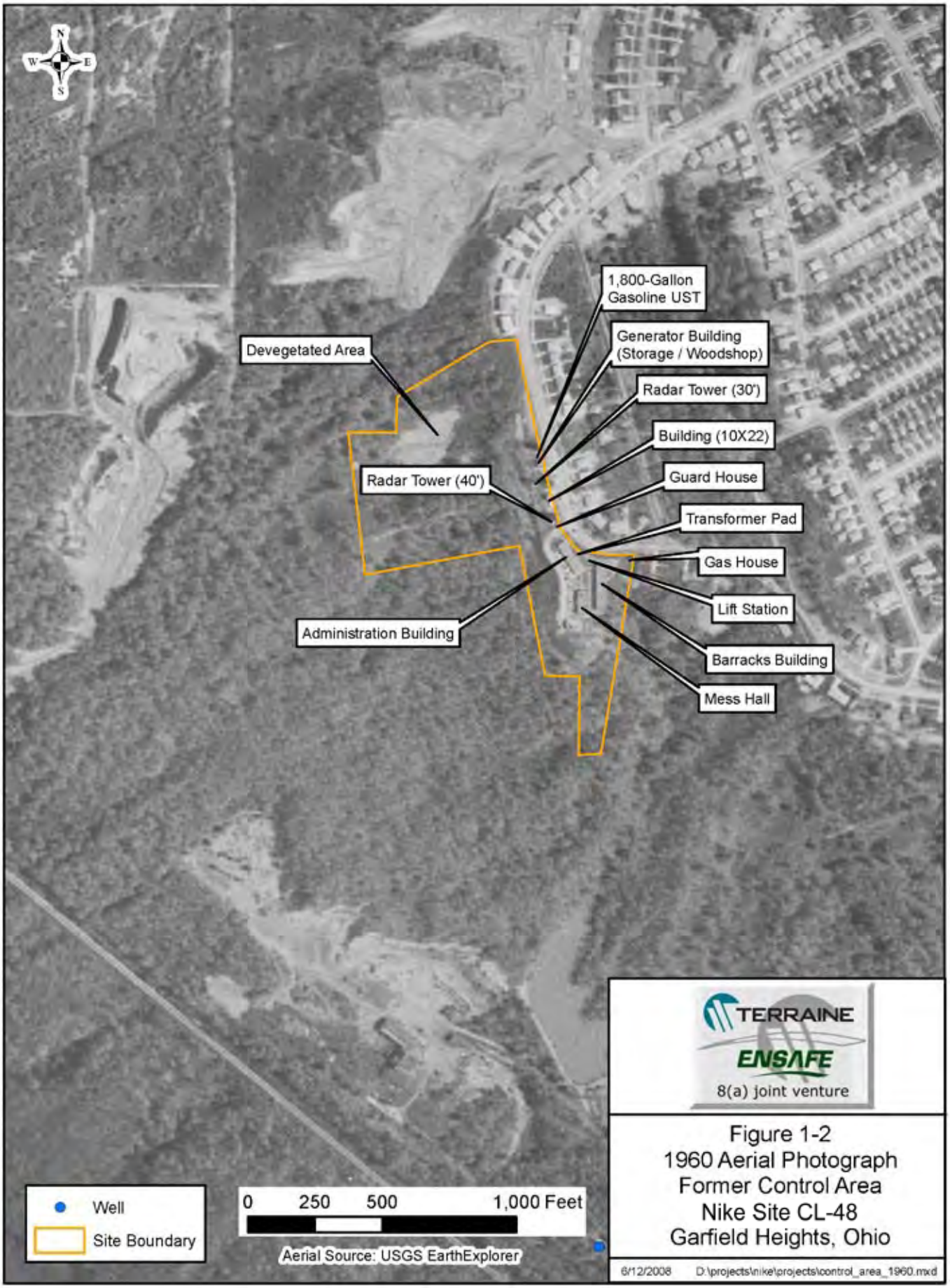


Figure 1-2
1960 Aerial Photograph
Former Control Area
Nike Site CL-48
Garfield Heights, Ohio

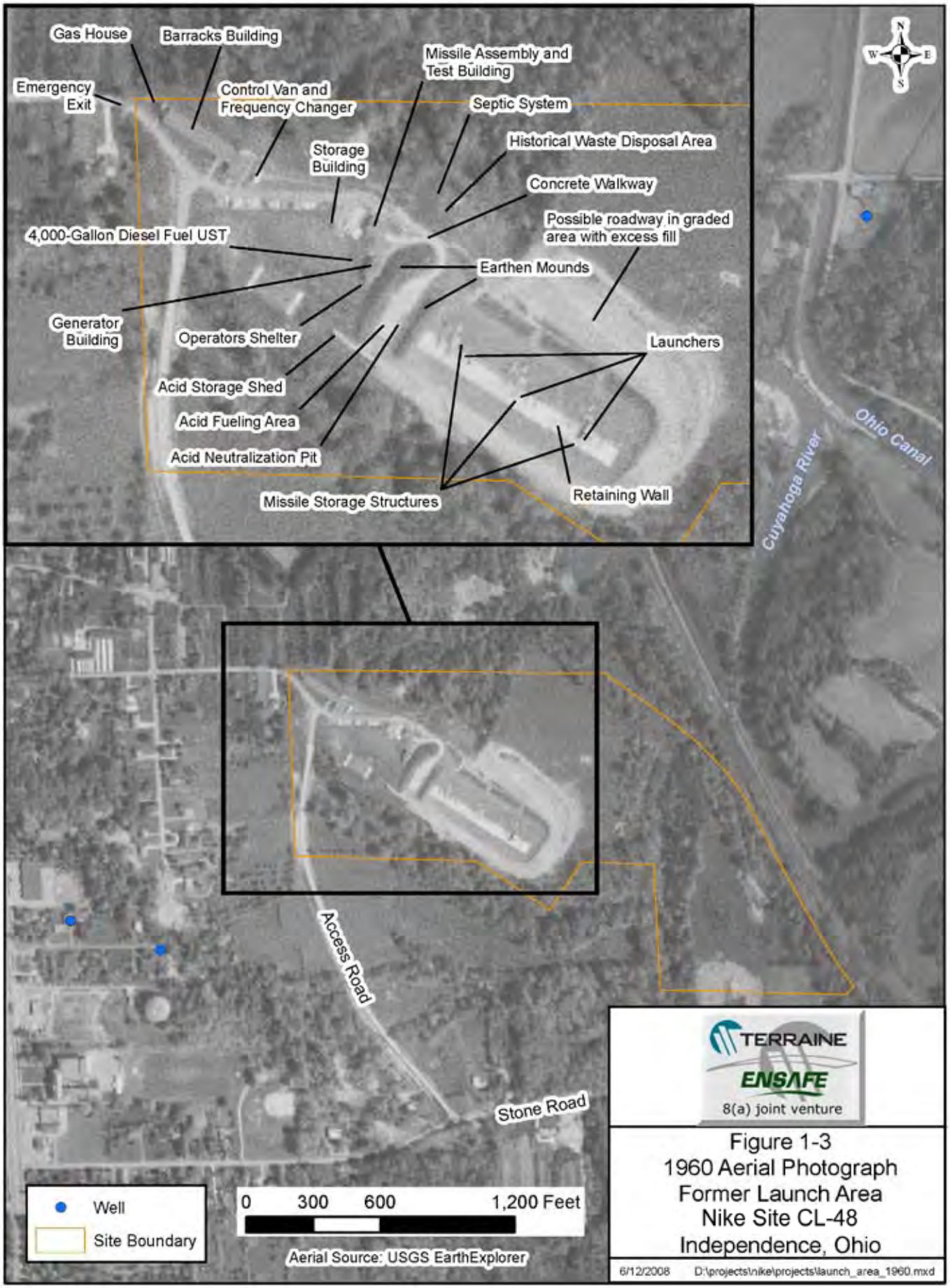


Figure 1-3
1960 Aerial Photograph
Former Launch Area
Nike Site CL-48
Independence, Ohio

Figure 1-4
2000 Aerial Photograph
Former Control Area
Nike Site CL-48
Garfield Heights, Ohio

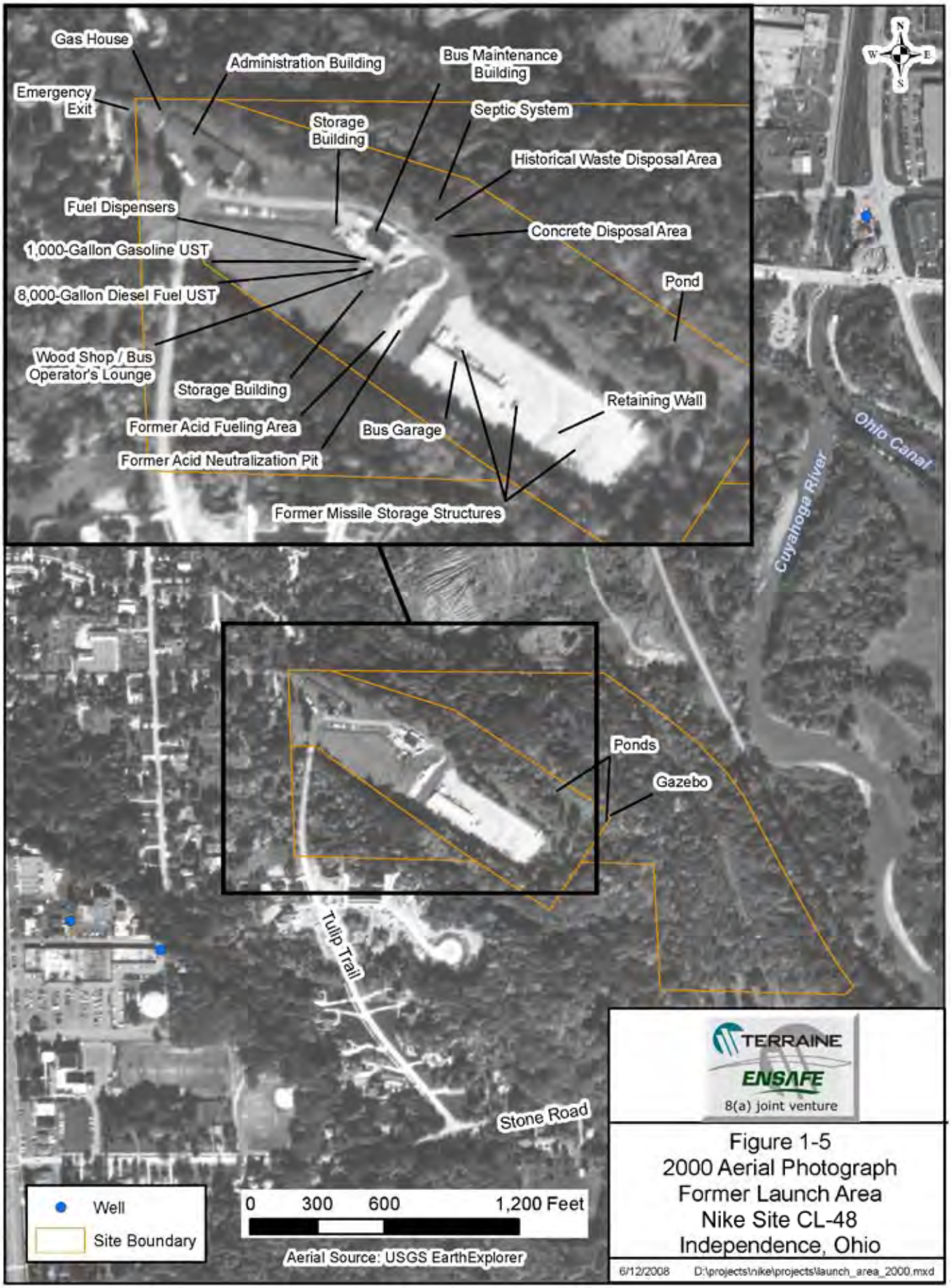


Figure 1-5
2000 Aerial Photograph
Former Launch Area
Nike Site CL-48
Independence, Ohio

1.4 Operational and Regulatory History

During the Cold War, Nike missile sites provided the last line of defense for the U.S. population and its industrial centers in the event of air warfare. The Nike system was created in response to the former Soviet Union's efforts to design and deploy long-range bombers.

The U.S. Government acquired the former Nike Site CL-48 from local landowners in 1956 and completed construction of the facility in early 1957. The former Nike Site CL-48 was operated as a Nike Ajax missile facility until 1961 and was declared excess in 1965. After being declared excess, the former Launch Area was acquired by the Independence Board of Education in 1967. The former Control Area was briefly transferred to the Ohio National Guard in 1967 and then acquired by the Garfield Heights Board of Education in 1970.

In 1956 and 1957, development of the former Launch Area included relocation of a farmhouse to an adjacent property; demolition of a barn and two storage sheds; construction of seven buildings; construction of three underground Missile Magazines; and construction of additional improvements including roads, storm sewers, a sewage septic system, natural gas lines, electric utilities, and an asphalt play court. The former Launch Area was used to assemble, maintain, store, and prepare missiles for firing. Structures present at the former Launch Area included underground Missile Magazines, a missile launch area, a missile fueling area, a Missile Assembly and Test Building, an Acid Storage shed, and other ancillary structures. During 1985 and 1986, as part of a building demolition/debris removal (BD/DR) project, the USACE capped the three underground Missile Magazines with approximately 1 foot of reinforced concrete, removed and plugged vents and other access points, followed by paving of the area with 1 inch of asphalt pavement. In addition, two earthen mounds located east and west of the former Acid Fueling Station were removed by excavating the soil and transporting it off site for disposal. The U.S. Government also removed a Sentry House, an asphalt play court, a steel hoist by the former Acid Fueling Area, and a number of light posts that were not being used by the Independence Board of Education. Since taking ownership of the property in 1967, the Independence Board of Education has constructed or installed the following improvements: a bus storage garage; an 8,000-gallon diesel fuel underground storage tank (UST); a 1,000-gallon UST, which replaced a 4,000-gallon gasoline UST (converted from fuel oil); two oil and gas wells installed in 2007; two ponds in fill material placed during development of the property; a gazebo for outdoor education classes; and a network of dirt trails throughout the undeveloped portions of the property. Existing buildings have undergone minor changes by the Independence Board of Education, including two additions to the former Missile Assembly and Test Building and construction of offices and bathrooms inside the former barracks building.

In 1956 and 1957, development of the former Control Area consisted of construction of six buildings and additional improvements, including radar towers, roads, storm sewers, a sewage pumping station and sanitary sewer line, natural gas lines, and electric utilities. The Control Area contained the various elements required to track incoming targets and to track and control the missile to the target. Structures that were present at the former Control Area included a guard house, battery control building, low-power acquisition radar, high-power acquisition radar, target-tracking and missile-tracking radars, generator building, radar collimation mast assembly, and other ancillary structures. During 1985 and 1986, as part of a BD/DR project, the USACE removed several site structures, including light standards, a Sentry House, a concrete block structure between the two radar towers, and two radar towers. Since taking ownership of the property in 1970, the Garfield Heights Board of Education has performed minor interior changes to site buildings, including construction of offices and bathrooms.

During 2001, the Ohio Environmental Protection Agency (Ohio EPA) prepared a Pre-Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Screening Assessment of the Garfield Heights and Independence, Ohio properties. Ohio EPA reviewed the list of FUDS in Ohio that had been deemed NFR and chose five former Nike sites, including the former Nike Site CL-48, for additional review. The five sites were selected based on their proximity to public areas, including residential areas and parks. Reports were prepared for each site to review available information to determine whether there was potential for the site to affect surrounding areas and to determine whether the site merited further investigation. The former Nike Site CL-48 was not recommended for placement into CERCLIS; however, Ohio EPA did not concur with the USACE NFR determination from 1984. Ohio EPA recommended that both the Garfield Heights and Independence properties be further investigated, beginning with a PA and SI, to evaluate the potential for contamination. Ohio EPA deemed that investigation was necessary to evaluate the potential for contamination in the area from typical Nike site features, such as USTs, radar towers, or transformers, as well as from activities such as on-site disposal, dumping, or landfilling. A detailed discussion of the history of the former Nike Site CL-48 is included in Sections 3 and 4 of the PA (TEJV, 2007).

The USACE original Scope of Work (SOW) dated June 2006, which was developed prior to the PA, identified three AOCs to be investigated during the SI. AOC 1 consisted of the former Acid Fueling Area at the Launch Area, AOC 2 was denoted as the former underground Missile Magazines at the Launch Area, and AOC 3 was a transformer pad at the Control Area. The SOW specified sampling of surface soil, shallow subsurface soil, and groundwater for the SI. Constituents of potential concern (COPCs) were initially identified as Resource Conservation and Recovery Act (RCRA) 8

metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs).

The TEJV completed the PA in December 2007. In the process of finalizing the PA, the Ohio EPA requested additional SI media testing within the former Control and Launch Areas of the former Nike Site CL-48. A contract modification was executed in March 2008 to address additional information requested by the Ohio EPA. The modified SOW consisted of 10 AOCs to be addressed by the SI.

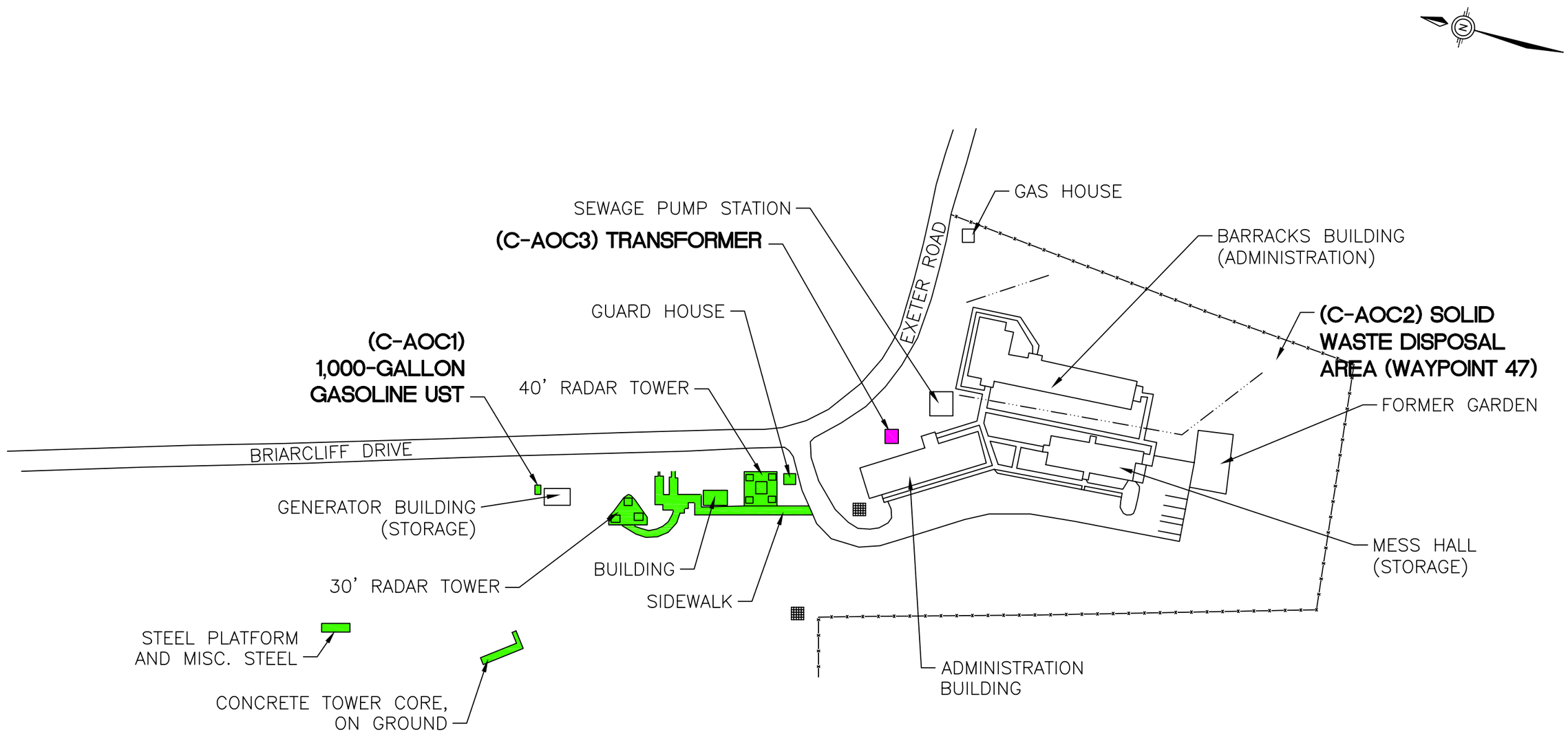
Three AOCs were identified at the former Control Area in Garfield Heights as shown on Figure 1-6:

1. Former 1,000-gallon gasoline UST area
2. Suspected hillside solid waste disposal area
3. Former transformer pad location

Seven AOCs were identified at the former Launch Area in Independence as shown on Figure 1-7:

1. Former Missile Assembly and Test Building
2. Former Missile Magazine Area
3. Former Acid Fueling Area
4. Former septic system/leach field
5. Suspected hillside solid waste disposal area
6. Former transformer pad location
7. Former Acid Storage Shed Area

The modified SOW specified sampling of surface soil, subsurface soil, and groundwater for the SI. Soil COPCs include Target Analyte List (TAL) metals, VOCs, SVOCs, PCBs, pesticides, herbicides, total petroleum hydrocarbons-gasoline range organics (TPH-GRO), and nitrate. Groundwater COPCs include TAL metals, VOCs, SVOCs, PCBs, pesticides, herbicides, and nitrate.



NOT TO SCALE

LEGEND

- STORM WATER CATCH BASIN
- STORM WATER DITCH
- STRUCTURE REMOVED IN 1960s
- STRUCTURE REMOVED IN 1986

FIGURE 1-6
AREAS OF CONCERN
FORMER CONTROL AREA
NIKE SITE CL-48
GARFIELD HEIGHTS, OHIO

REQUESTED BY: H.BRADY	TERRAINE ENSAFE 8(a) joint venture
DRAWN BY: BRONSON	
DWG DATE: 06/12/08	
DWG NO: 802963C005	

SOURCE:
U.S. ARMY CORPS OF ENGINEERS. CLEVELAND DEFENSE AREA CL-48, NIKE RESTORATION DETAILS. MAP, DRAWING NUMBER C933-10-02/CL-48, SHEET 1 OF 3, (JUNE 1985).

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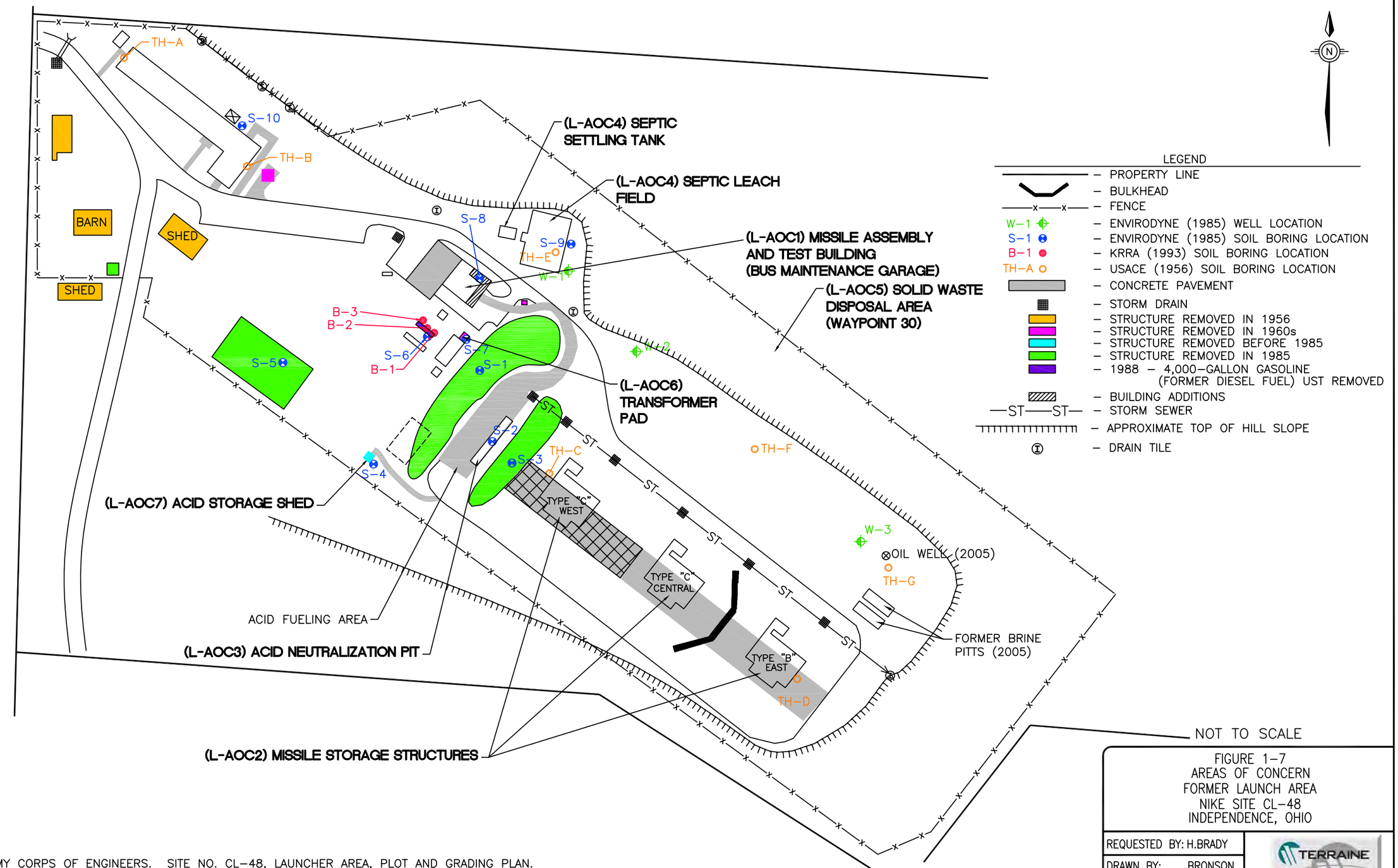

SOURCE:
U.S. ARMY CORPS OF ENGINEERS. SITE NO. CL-48, LAUNCHER AREA, PLOT AND GRADING PLAN.
MAP, DRAWING NUMBER 16-06-48, SHEET 2 OF 14, (AS BUILT 11 MARCH 1957), HUNTINGTON, WV.

FIGURE 1-7
AREAS OF CONCERN
FORMER LAUNCH AREA
NIKE SITE CL-48
INDEPENDENCE, OHIO

REQUESTED BY: H.BRADY	TERRAINE ENSAFE 8(a) joint venture
DRAWN BY: BRONSON	
DWG DATE: 06/12/08	
DWG NO: 802963B005	

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1.5 Previous Environmental Investigations Summary

Environmental studies and activities are summarized in this section. Detailed information regarding previous environmental studies and activities is provided in Section 2 of the PA (TEJV, 2007).

The former Launch Area has been the subject of two environmental investigations. In 1985, Envirodyne Engineers installed 10 soil borings (SBs) and three groundwater monitoring wells and collected soil samples, groundwater samples, and samples of accumulated water in two Missile Magazine structures. Results of these samples indicated the presence of tetrachloroethene and lead in soil adjacent to the former Missile Assembly and Test Building, and PAHs and lead in the acid neutralization pit in the former Acid Fueling Area, at concentrations exceeding U.S. Environmental Protection Agency (USEPA) Region 9 standards. Elevated lead concentrations were reported in the water sample from one of the Missile Magazines.

Karl R. Rohrer & Associates (KRRA) performed a second investigation in 1993 to evaluate a potential release from the former 4,000-gallon UST. This tank was originally installed in 1956 as a fuel oil source for site generators. Following acquisition of the property on 2 February 1967, the Independence Board of Education converted the tank from fuel oil to gasoline, installed a pump, and used the fuel in school buses. In 1988, the Independence Board of Education removed the tank and replaced it with a 1,000-gallon UST. Results of the KRRA investigation identified elevated gasoline constituents in soil and groundwater samples collected from within the former tank pit. Review of the Ohio Bureau of UST Regulations file indicates the state issued a letter of NFR on 16 May 1994 for this historical release without requiring any further remedial activities.

A CERCLA PA for the site was conducted in 2006 and 2007 by the TEJV, with the PA finalized in December 2007. The PA confirmed the potential for soil and groundwater contamination associated with possible releases during past DoD activities at the former Nike Site CL-48 Control and Launch Areas.

2.0 PROJECT OBJECTIVES & SCOPE OF WORK

2.1 Project Objectives

The overall objective of the SI is to gather information to support a decision regarding the need for further action at each AOC.

The project objectives are as follows for the Control Area:

- To determine whether potential releases from the former 1,000-gallon UST have impacted the environment (C-AOC1).

- To determine whether materials contained in the hillside disposal site (identified as Waypoint 47 in the PA) have resulted in releases to the environment (C-AOC2).

- To determine whether transformer oil leaked out of transformers, resulting in releases of PCBs to the environment (C-AOC3)

The project objectives are as follows for the Launch Area:

- To determine whether potential releases of solvents, paints, or fuels to floor drains within the former Missile Assembly and Test Building (current Independence Board of Education bus maintenance garage) may have occurred, with constituents being released immediately outside the building doorways (L-AOC1).

- To determine whether potential releases of solvents or lead-based paint (from degradation of painted surfaces) to surface water may have occurred from DoD's historical operation of the missile storage structures and if accumulated water in sumps connected to footer drains was discharged from the magazine structures, resulting in releases to the environment (L-AOC2).

- To determine whether releases from the acid neutralization pit and/or the drain system underlying the pit have impacted the environment (L-AOC3).

- To determine whether materials disposed of via the septic system (most likely paints containing oils, metallic pigments, possibly PCBs, and general domestic cleaning products) have resulted in releases to the former leach field area (L-AOC4).

- To determine whether materials contained in the hillside disposal site (identified as Waypoint 30 in the PA) have resulted in releases to the environment (L-AOC5).

- To determine whether transformer oil leaked out of transformers resulting in releases of PCBs to the environment (L-AOC6).

- To determine whether potential releases from the Acid Storage shed have impacted the environment (L-AOC7).

To achieve the project objectives outlined above, surface and subsurface soil sampling was planned for the SI. A component of the soil sampling program included the collection of Multi Increment® (MI) soil samples in prescribed AOCs. The soil sampling program also included the collection of surface soil samples from a designated area referred to as Launch Area background (LAB). The groundwater sampling program consisted of the installation and sampling of groundwater monitoring wells at the Launch Area only.

Surface water and sediment sampling were not scoped for this SI with the understanding that they may be added if soil or groundwater sampling indicate the presence of a potential risk to surface water or sediment.

2.2 Scope of Work

Under the modified SI SOW, individual tasks were developed within the Work Plan (WP) and Sampling and Analysis Plan (SAP). Project tasks were:

- Background review and preparation of all planning documents

- Field work and sample collection

- Sample analyses, data assessment, data validation, and reporting

- Data evaluation, fate and transport analysis, and risk screening

- Preparation of reports documenting the findings of the SI with recommendations for further work, if necessary

Planning documents previously developed and submitted by the TEJV for the former Nike Site CL-48 SI include the WP with a Contractor Quality Control Plan; Data Quality Objectives (DQO) Process Report; and SAP, which consists of the Field Sampling Plan and Quality Assurance Project Plan (QAPP). The WP and DQO Process Report defined the Site problems and the project approach to resolve the problems. Details of the site-specific sampling design and analyses for each soil and groundwater sample location were provided in the final SAP (October 2008) and are summarized in Table 2-1.

Table 2-1
Planned Sample Locations and Analyses
Former Nike Site CL-48

Area	Surface Soil (0-12")		Subsurface (1-3')		Subsurface at Discrete Intervals (specified)		Groundwater	
Former Missile Assembly and Test Building Launch Area (L-AOC1)	1. Trace/locate floor drains to evaluate discharge locations. 2. Based on floor drain discharge location(s), propose to defer discharge sampling to Septic Leach Field or collect a single soil/sediment grab sample below hillside discharge point, if applicable. 3. MI Sampling (sample analysis as shown below) along perimeter of building at ingress/egress locations. 4. One soil boring (to 30 ft) adjacent to Envirodyne boring S-8; convert to groundwater monitoring well (sample analysis as shown below). 5. Engineering Properties of Soil – One soil boring to 6 ft; 3 samples (0-2 ft; 2-4 ft; 4-6 ft).							
	1 MI sample; 4 VOC grabs	TAL Metals Soil pH VOCs SVOCs	Not proposed	Not proposed	1 soil boring 3 samples – Intervals: 1-3 ft, 3-5 ft, and immediately above groundwater	TAL Metals Soil pH VOCs SVOCs	1 soil boring converted to well 1 filtered 1 unfiltered	TAL Metals VOCs SVOCs pH (field)
Former Missile Magazine Area Launch Area (L-AOC2)	1. Activities assume magazine footer drains are at approximately 23-24 ft, per 1957 USACE map#33-15-20_02. 2. No MI sampling (no evidence of exposed soil); soil sampling at depth. 3. Six soil borings – three borings to 24 ft; three borings to 30 ft and convert to monitoring wells (sample analysis as shown below). 4. Engineering Properties of Soil – one soil boring to 30 ft; 1 sample (23-25 ft) and convert to monitoring well (sample analysis as shown below).							
	Not proposed	Not proposed	Not proposed	Not proposed	6 soil borings 9 samples – Intervals: 6 samples – 23 to 24 ft (below footer drain), and 3 samples immediately above groundwater	TAL Metals Soil pH VOCs SVOCs PCBs (1)	4 soil borings converted to wells 4 filtered 4 unfiltered	TAL Metals VOCs SVOCs pH (field)
Former Acid Fueling Area Launch Area (L-AOC3)	1. Activities assume acid neutralization pit is 40 ft long, 5 ft wide and that the gravel backfill/soil interface is between 5.5 and 6.5 ft deep, per 1957 USACE map#16-06-48_06. Remainder of Acid Fueling Area was and remains covered by concrete pavement. 2. Based on pit discharge location, propose to collect soil/sediment grab sample below hillside discharge point. 3. Three soil borings within acid neutralization pit – two borings to 8 ft and one boring to 30 ft; convert to groundwater monitoring well (sample analysis as shown below). 4. Engineering Properties of Soil – One soil boring to 5-6.5 ft (estimated); 1 sample (immediately below the pit gravel).							
	3 grab samples	TAL Metals Soil pH VOCs SVOCs Nitrate	Not proposed	Not proposed	3 soil borings 4 samples – Intervals: 3 samples (immediately below gravel backfill), and 1 immediately above groundwater	TAL Metals Soil pH VOCs SVOCs Nitrate	1 soil boring converted to well 1 filtered 1 unfiltered	TAL Metals VOCs SVOCs Nitrate pH (field)

Table 2-1 – continued
Planned Sample Locations and Analyses
Former Nike Site CL-48

Area	Surface Soil (0-12")		Subsurface (1-3')		Subsurface at Discrete Intervals (specified)		Groundwater	
Former Septic System/Leach Field Launch Area (L-AOC4)	1. Trace/locate leach lines (LL) to evaluate soil boring locations. 2. Four soil borings adjacent to LL, sample at bottom of line (estimated 2 - 3 ft deep). 3. One soil boring to 30 ft; convert to monitoring well adjacent to settling tank (ST) (sample analysis as shown below). 4. Engineering Properties of Soil – One soil boring to 8 ft; 1 sample (2-3 ft).							
	Not proposed	Not proposed	Not proposed	Not proposed	5 soil borings 7 samples – Intervals: 4 LL samples below drain tiles, 3 ST samples 4-6 ft, 6-8 ft, and immediately above groundwater	TAL Metals Soil pH VOCs SVOCs PCBs (1) Pests/Herbs (1)	1 soil boring converted to well 1 filtered 1 unfiltered	TAL Metals VOCs SVOCs pH (field) PCBs Pests/Herbs
Former Gasoline UST Control Area (C-AOC1)	1. Determine depth of bottom of former UST (estimated at 6 ft deep) by drilling. 2. No MI sampling; soil sampling at depth per current BUSTR closure assessment guidelines. 3. Two soil borings to 8 ft at both ends of former UST (sample analysis as shown below). 4. Engineering Properties of Soil – One soil boring to 8 ft; 1 sample (6-8 ft).							
	Not proposed	Not proposed	Not proposed	Not proposed	2 soil borings 2 samples – Intervals: 6-8 ft (immediately below base of former tank pit)	VOCs Lead TPH-GRO	Not proposed	Not proposed
Solid Waste Disposal — Hillsides Launch Area (L-AOC5)	1. Based on PA, drum shells at Launch Area Waypoint 30 may be related to former DoD activities. 2. MI sampling (sample analysis as shown); samples centered on drum shells (9 aliquots on a 5-foot grid). 3. No Engineering Properties of Soil proposed for this area.							
	2 MI samples 2 VOC grabs	TAL Metals Soil pH VOCs/SVOC	2 MI samples 2 VOC grabs	TAL Metals Soil pH VOCs/SVOCs	Not proposed	Not proposed	Not proposed	Not proposed
Solid Waste Disposal — Hillsides Control Area (C-AOC2)	1. Based on PA, Control Area Waypoint 47 may be related to former DoD activities. 2. MI sampling (sample analysis as shown). 3. No Engineering Properties of Soil proposed for this area.							
	1 MI sample; 4 VOC grabs	TAL Metals Soil pH VOCs/SVOCs	1 MI sample; 4 VOC grabs	TAL Metals Soil pH VOCs/SVOCs	Not proposed	Not proposed	Not proposed	Not proposed

Table 2-1 – continued
Planned Sample Locations and Analyses
Former Nike Site CL-48

Area	Surface Soil (0-12")		Subsurface		Subsurface at Discrete Intervals (specified)		Groundwater	
Former Transformer Pad Control Area (C-AOC3)	1. MI sampling (samples collected from four sides of pad – sample analysis as shown below). 2. Samples collected within 24 inches of pad.							
	1 MI sample	PCBs	Not proposed	Not proposed	Not proposed	Not proposed	Not proposed	Not proposed
Former Transformer Pad Launch Area (L-AOC6)	1. MI sampling (samples collected from three sides of pad – sample analysis as shown below). 2. Samples collected within 24 inches of pad.							
	1 MI sample	PCBs	Not proposed	Not proposed	Not proposed	Not proposed	Not proposed	Not proposed
Former Acid Storage Shed Launch Area (L -AOC7)	1. MI sampling (samples collected from four sides of pad – sample analysis as shown below). 2. Engineering Properties of Soil – 1 sample (0-2 ft).							
	1 MI sample	TAL Metals Soil pH Nitrate	1 MI sample	TAL Metals Soil pH Nitrate	Not proposed	Not proposed	Not proposed	Not proposed
Background Soil	Minimum of 8 sample locations sampled; samples analyzed from Surface Soil for TAL Metals and SVOCs.							
Groundwater Sampling	11 Groundwater Monitoring Wells Installed at Launch Area, as follows: • 7 wells converted from soil borings, as described above. • 1 well at location of USACE's 1957 proposed septic settling system (near former asphalt play court). • 1 well down slope and north of former Missile Magazine structures (to assess groundwater flow direction). • 1 well southwest of former western Missile Magazine structure (to assess groundwater flow direction). • 1 well south of former eastern Missile Magazine structure (to assess groundwater flow direction).							
	NA	NA	NA	NA	NA	NA	11 unfiltered 11 filtered (TAL metals only)	TAL Metals VOCs SVOCs pH (field) Nitrate (1) PCBs (1) Pests (1) Herbs (1)

Notes:
ft = feet
MI = Multi Increment
VOC = volatile organic compounds
TAL = Target Analyte List
SVOCs = semivolatile organic compounds
USACE = U.S. Army Corps of Engineers
(1) = 1 sample analyzed for the parameter(s)
PCBs = polychlorinated biphenyl compounds
LL = leach lines
ST = settling tank
Pests = pesticides
Herbs = herbicides
UST = underground storage tank
NA = not applicable
BUSTR = Ohio Bureau of UST Regulations
TPH-GRO = total petroleum hydrocarbons-gasoline range organics
DoD = Department of Defense
PA = Preliminary Assessment

On 22 October 2008, a Site visit was conducted with personnel from the Ohio EPA and the TEJV. The project scope, objectives, sampling methodologies, and sampling locations were discussed during the meeting. It was determined that Site conditions warranted minor adjustments to the SAP. The TEJV submitted a letter dated 29 October 2008 to the Ohio EPA outlining these modifications, which included:

- At the former transformer pad, a single grab soil sample would replace the originally proposed MI sample because pavement is present.

- At the former Missile Assembly and Test Building, a single grab sample would replace the originally proposed MI sample because pavement is present.

- Soil samples collected adjacent to the former Missile Assembly and Test Building would not be analyzed for SVOCs because asphaltic pavement is present where these borings would be advanced.

- The four soil borings proposed for the septic leach field area would be advanced to an approximate depth of 6 feet (3 feet deeper than in the planning documents). The increased boring depth was required to reach the estimated depth of the leach lines observed in the distribution box – where the discharge pipes were observed at an estimated depth of 6 feet.

A background sample area was also designated during the Site visit. This area is near the gated entrance to the property in a wooded area south of the fence line.

3.0 INVESTIGATION SUMMARY

Field work for the SI was completed from November 2008 through January 2009. Field sampling activities addressed AOCs at both the Control and Launch Areas. Only soil sampling was conducted at the Control Area. Both soil and groundwater sampling were conducted at the Launch Area. Soil sampling and groundwater monitoring well installation were conducted in November 2008. Groundwater sampling was conducted at the Launch Area in early December 2008.

Surface and subsurface soil samples were collected from seven soil borings (SB-1 through SB-7) and two MI sample areas (MI-1 and MI-2) at the Control Area. No monitoring wells were planned or installed at the Control Area. Figure 3-1 denotes the three AOCs and all sample locations at the Control Area.

Surface and subsurface soil samples were collected from 28 soil borings (SB-1 through SB-28) and three MI sample areas (MI-1, MI-2, and MI-3) at the Launch Area. Additionally, surface soil samples were collected from eight background locations in the Launch Area (SB-33 through SB-40). Per the October 2008 modifications, MI sampling was conducted in only two of the four planned AOCs at the Launch Area. Figure 3-2 denotes the seven AOCs and all sample locations at the Launch Area.

Generally, soil samples were analyzed for VOCs, SVOCs, TAL metals, and pH. One soil sample from the former Missile Magazine Area was also analyzed for PCBs. Soil samples from the former Acid Fueling Area were also analyzed for nitrate. Soil samples from the former septic system/leach field were analyzed for PCBs, pesticides, and herbicides. Soil samples surrounding both former transformer pads were only analyzed for PCBs. Soil samples from the former Acid Storage Shed were only analyzed for TAL metals, nitrate, and soil pH. Soil samples from the former UST area were only analyzed for VOCs, lead, and TPH-GRO.

Soil samples were collected and analyzed for engineering properties within six AOCs. These locations included the former Missile Assembly and Test Building, former Missile Magazine Area, former Acid Fueling Area, former septic system/leach field, and former Acid Storage Shed in the Launch Area and the former UST area in the Control Area. Geotechnical analyses for engineering properties included moisture content, grain size, Atterburg limits, unified soil classification, specific gravity, pH, and fraction organic carbon using standard ASTM International (ASTM) methods.

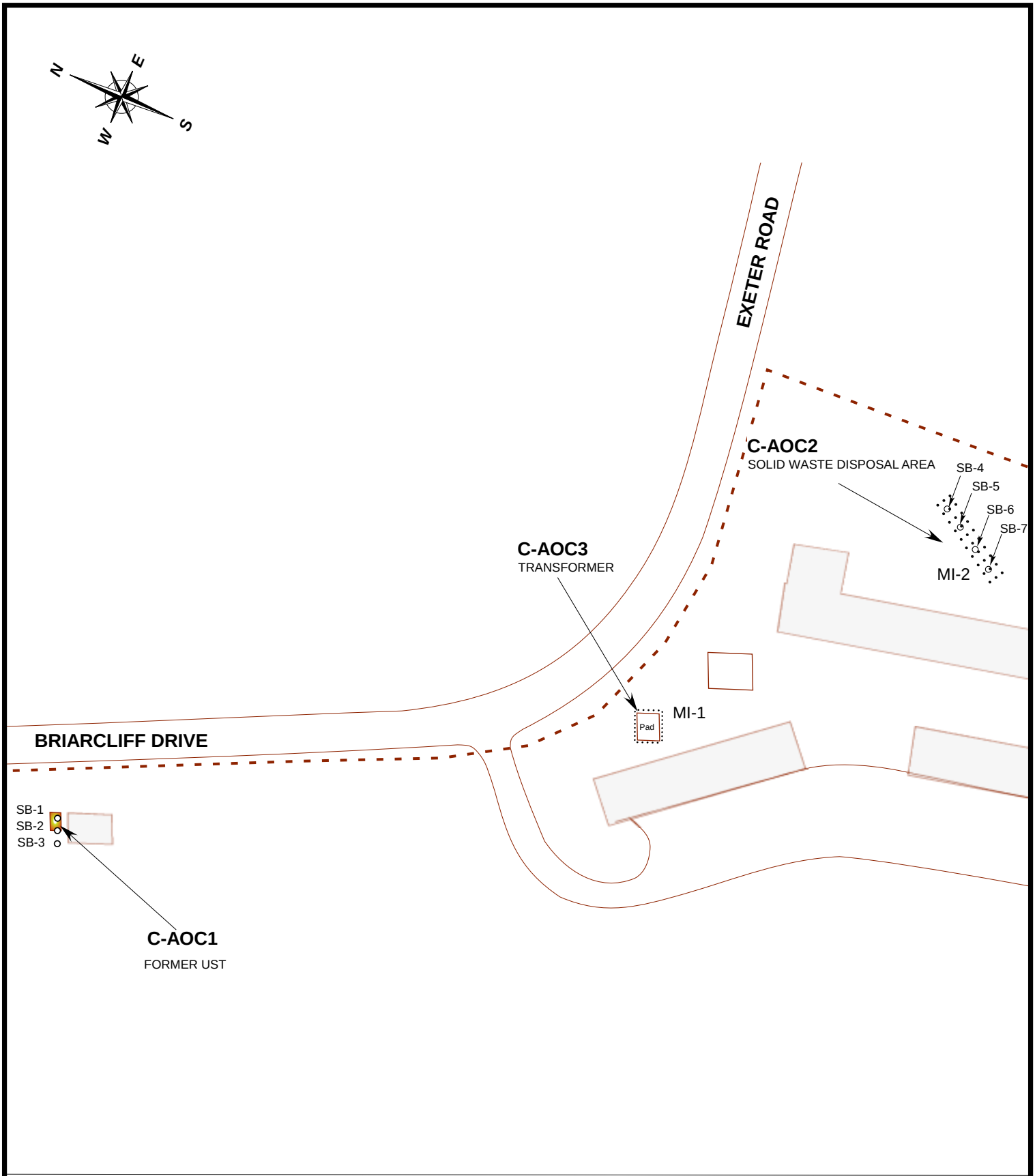


FIGURE 3-1
SI SAMPLE LOCATIONS

FORMER CONTROL AREA
NIKE SITE CL-48
GARFIELD HEIGHTS, OHIO

DATE: 11/19/2009
DRAWN BY: JS/JP

SOURCE: GOOGLE EARTH
NOT TO SCALE

LEGEND

C-AOC	AREA OF CONCERN
SB-13	SOIL BORING
MI-2	MULTI-INCREMENTAL SAMPLING LOCATIONS
	FENCE

TERRAINE
ENSAFE
8(a) joint venture

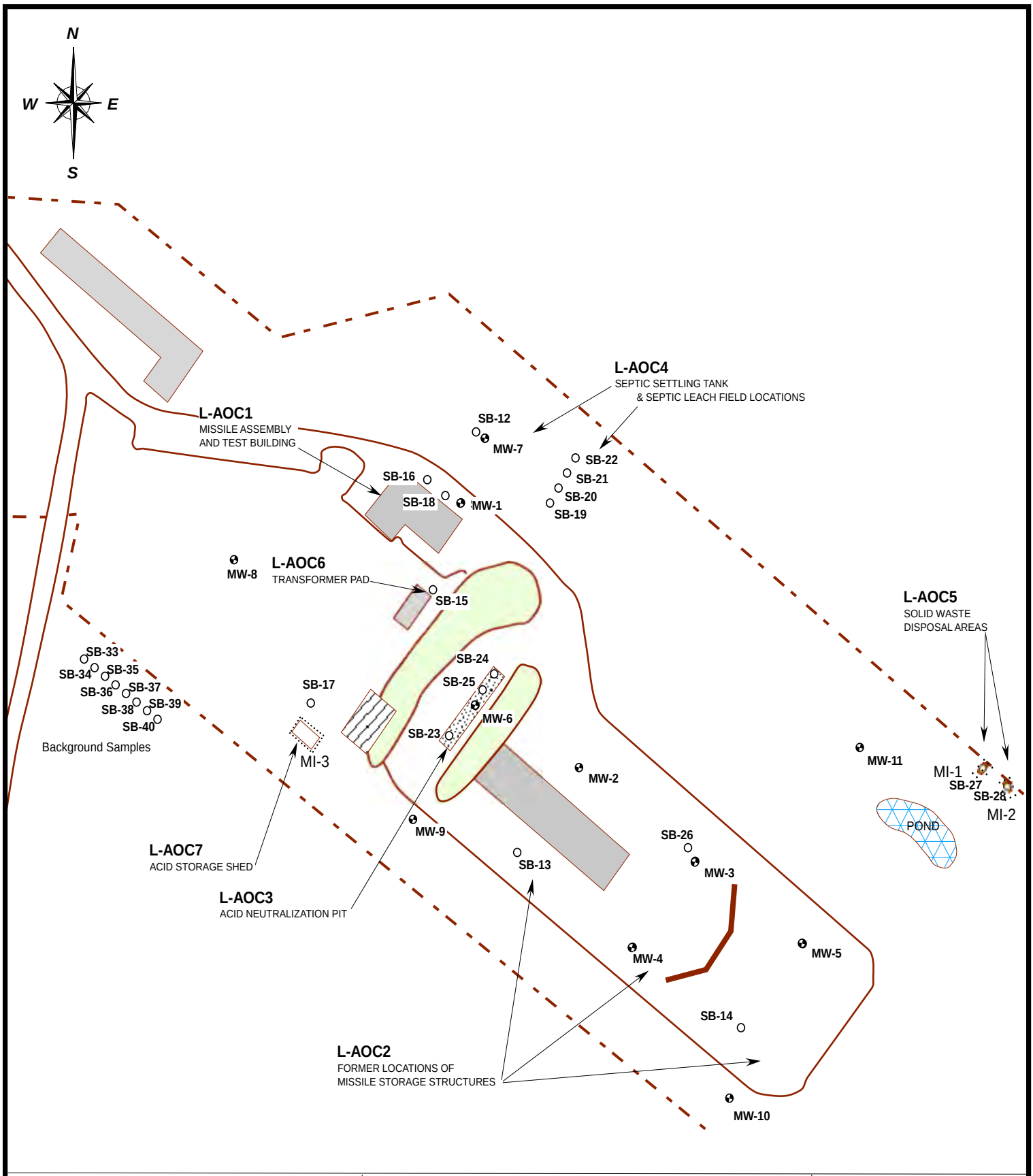


FIGURE 3-2
SI SAMPLE LOCATIONS

FORMER LAUNCH AREA
NIKE SITE CL-48
INDEPENDENCE, OHIO

DATE: 11/19/2009
DRAWN BY: JS/JP

SOURCE: GOOGLE EARTH
NOT TO SCALE

LEGEND

L-AOC	AREA OF CONCERN
MW-9	GROUNDWATER MONITORING WELL
	FENCE
MI-1	MULTI-INCREMENTAL SAMPLING LOCATIONS
SB-13	SOIL BORING

TERRAINE
ENSAFE
8(a) joint venture

Eleven monitoring wells were installed in November 2008 at the Launch Area. One monitoring well was installed in the former Missile Assembly and Test Building area (monitoring well MW-1). Four monitoring wells were installed in the former Missile Magazine Area (MW-2, MW-3, MW-4, and MW-5). One monitoring well was installed in the former Acid Fueling Area (MW-6). One monitoring well was installed near the former septic system/leach field (MW-7). Four additional monitoring wells were installed to assess groundwater flow direction at the Launch Area (MW-8, MW-9, MW-10, and MW-11). Monitoring well MW-8 is located in the area of a proposed septic settling system based on a 1957 USACE site drawing. Soil borings not converted to monitoring wells were properly abandoned by using Holeplug® bentonite pellets and were topped with either concrete in paved areas or soil in unpaved areas.

In November 2008, global positioning system technology was used to obtain coordinates for discrete sample locations, corners/reference points for MI sampling plots, monitoring wells, and other site features. Monitoring wells were professionally surveyed so that hydrogeological data could be determined based on depth to groundwater (DTW) measurements.

The TEJV returned to the Site in December 2008 to collect groundwater elevation data and groundwater samples from the 11 monitoring wells. Generally, groundwater samples were analyzed for VOCs, SVOCs, and TAL metals. The groundwater sample from the former Acid Fueling Area was also analyzed for nitrate. Additionally, the groundwater sample from the former septic system/leach field was analyzed for PCBs, pesticides, and herbicides. Two of the four site monitoring wells did not produce water (MW-8 and MW-9).

Another Site visit was conducted in January 2009 to coordinate pickup and disposal of drums containing investigation-derived waste (IDW).

With the few exceptions as noted above, the SI was conducted in accordance with the SAP. The sequence and details concerning field activities are presented in the following sections. Deviations from the SAP are described when applicable in the appropriate sections.

3.1 Field Activities

The general sequence of key field activities consisted of the following:

1. Site visit (personnel from the Ohio EPA and TEJV) — October 2008

2. Field investigation (soil sampling and monitoring well installation and development) — November 2008

3. Survey soil sample and monitoring well locations and elevations — November 2008

4. Collect groundwater elevation data and groundwater samples — December 2008

5. Manage and dispose of IDW — January 2009

Photographic documentation of the former Nike Site CL-48 study area was conducted prior to initiating Site disturbance and subsequent to Site reclamation. Photographs were also taken to document all field activities. Photographs are in Appendix A. All sample elevations and locations were surveyed by Campbell and Associates, Inc. on 24 and 25 November 2008. Elevation and coordinate data from the survey are in Appendix B. Field procedures are documented in the field notes in Appendix C.

3.2 Sample Locations and Analytical Requirements

To meet the defined project objectives, soil and/or groundwater samples were collected within the identified AOCs. The sampling design and analyses proposed for each AOC were detailed in the approved SAP. Soil COPCs included TAL metals, VOCs, SVOCs, PCBs, pesticides, herbicides, TPH-GRO, and nitrate. Groundwater COPCs included TAL metals, VOCs, SVOCs, PCBs, pesticides, herbicides, and nitrate.

As detailed previously, slight modifications to the plans were made during the 22 October 2008 Site visit. The number of sample locations for each area, sample location names, and analytical parameters are summarized in Table 3-1. To facilitate AOC and sample identification, the AOC designations were abbreviated for the SI (e.g., C-AOC1 was designated as CA1 for the UST area at the Control Area). At the Launch Area, the background soil area is designated LAB, and LA0 denotes the four monitoring wells installed to assess groundwater flow direction.

Table 3-1
SI Sample Locations and Analyses
Former Nike Site CL-48

Area of Concern	No. of Sample Locations	Sample Locations	Analytes
Control Area - Soil			
CA1 - Gasoline UST	3	SB-1, SB-2	VOCs TPH-GRO Lead
		SB-3	Engineering Properties
CA2 - Hillside – Solid Waste Disposal	5	MI-2	TAL Metals Soil pH SVOCs
		SB-4, SB-5, SB-6, SB-7	VOCs (only SBs)
CA3 - Transformer Pad	1	MI-1	PCBs
Launch Area - Soil			
LA1 - Missile Assembly and Test Building	3	SB-1, SB-16	TAL Metals Soil pH SVOCs (SB-1) VOCs
		SB-18	Engineering Properties
LA2 - Missile Magazine Area	7	SB-2, SB-3, SB-4, SB-5, SB-13, SB-14	TAL Metals Soil pH SVOCs VOCs PCBs (SB-3)
		SB-26	Engineering Properties
LA3 - Acid Fueling Area	4	SB-6, SB-23, SB-24	TAL Metals Soil pH SVOCs VOCs Nitrate
		SB-25	Engineering Properties
LA4 - Septic System/Leach Field	6	SB-7, SB-19, SB-20, SB-21, SB-22	TAL Metals Soil pH SVOCs VOCs PCBs (SB-20) Pests/Herbs (SB-20)
		SB-12	Engineering Properties
LA5 - Hillside – Solid Waste Disposal	4	MI-1, MI-2	TAL Metals Soil pH SVOCs
		SB-27, SB-28	VOCs (only SBs)

Table 3-1 - continued
SI Sample Locations and Analyses
Former Nike Site CL-48

Area of Concern	No. of Sample Locations	Sample Locations	Analytes
Launch Area - Soil			
LA6 - Transformer Pad	1	SB-15	PCBs
LA7 - Acid Storage Shed	2	MI-3	TAL Metals Soil pH Nitrate
		SB-17	Engineering Properties
LAB - Background	8	SB-33, SB-34, SB-35, SB-36, SB-37, SB-38, SB-39, SB-40	TAL Metals SVOCs
Launch Area - Groundwater			
LA1 - Missile Assembly & Test Building	1	MW-1	TAL Metals Field pH SVOCs VOCs
LA2 - Missile Magazine Area	4	MW-2, MW-3, MW-4, MW-5	TAL Metals Field pH SVOCs VOCs
LA3 - Acid Fueling Area	1	MW-6	TAL Metals Field pH SVOCs VOCs Nitrate
LA4 - Septic System/Leach Field	1	MW-7	TAL Metals Field pH SVOCs VOCs PCBs Pests/Herbs
LA0 - Site Groundwater	2	MW-10, MW-11	TAL Metals Field pH SVOCs VOCs

***Notes*:**
TAL = Target Analyte List
PAHs = polycyclic aromatic hydrocarbons
VOCs = volatile organic compounds
SVOCs = semivolatile organic compounds
SB = Soil Boring
MI = Multi Increment® Sample Area
MW = Monitoring Well
Pests = pesticides
Herbs = herbicides

Except where previously noted, the sampling collection and analytical procedures outlined in the SAP were followed. As indicated in the SAP, all samples collected for this SI were identified by a unique sample identification (ID) code. That ID code was recorded on the sample label affixed to the sample container, in the field log, and on the analytical chain-of-custody (COC) form. The sample ID code was used to track each sample as well as cross-reference sample data with other activities. Except for quality assurance (QA) samples, soil and groundwater samples were submitted to TestAmerica Laboratories, Inc. (TA) of North Canton, Ohio. The TA courier picked up samples at the Launch Area at pre-arranged times throughout the field endeavor as requested by the TEJV Field Team. For non-MI samples, TA of North Canton shipped the samples directly to TA of Chicago, Illinois for analysis. MI soil samples were prepared per the SAP by TA of North Canton prior to shipping to TA of Chicago for analysis. TA of Chicago shipped the eight Shelby tubes directly to their South Burlington, Vermont laboratory for analysis of engineering properties. Additionally, as prescribed in the SAP, duplicate (split) samples, matrix spike/matrix spike duplicate (MS/MSD) samples, QA samples, and rinsate samples were collected. The field duplicate, MS/MSD, and rinsate samples were submitted to TA of Chicago for analysis, while the QA samples were shipped separately to CT Laboratories in Baraboo, Wisconsin for independent analysis. Appendix D includes the complete set of laboratory analytical results, and Appendix E contains the Data Verification/Validation Report (DVR).

3.3 Soil Sampling

Soil sampling was performed in accordance with the SAP. Direct-push technology (DPT) soil sampling was conducted using a track-mounted Geoprobe® model 54 LT. Split spoon sampling was conducted with a rubber-tracked CME® model L60 or an Acker Renegade® auger rig. All drilling equipment was owned and operated by HAD, Inc. of Rittman, Ohio. The TEJV also collected soil samples by hand with a soil probe in MI areas and locations inaccessible to drilling equipment. Soil samples were collected from 10 to 23 November 2008. Samples were collected at the prescribed depths as detailed in Table 2-1, unless otherwise noted. The numbers and names of sample locations within each AOC are summarized in Table 3-1.

Control Area – Soil samples were collected from seven discrete locations (soil borings SB-1 through SB-7) and two MI areas (MI-1 and MI-2) to address three AOCs.

Former UST area (CA1) – Two DPT soil borings (SB-1 and SB-2) were advanced to a depth of 8 feet below ground surface (bgs). Soil samples from the 6- to 8-foot interval were submitted for analysis of VOCs, TPH-GRO, and lead. A third soil boring (SB-3) was advanced to collect a Shelby tube from 6 to 8 feet for analysis of engineering properties.

Suspected solid waste disposal area on the hillside (CA2) – Two MI samples were collected for analysis of TAL metals, pH, and SVOCs from an area designated MI-2. Surface (0-12 inches) and subsurface (1-2 feet) soil samples were collected with a soil probe. A planned completion depth of 3 feet for the subsurface MI-2 sample could not be achieved due to the presence of weathered rock and tree roots at this location. Four surface and four subsurface grab samples were collected from sample locations (SB-4, SB-5, SB-6, and SB-7) within the MI-2 area for VOC analysis. Thirty aliquots were collected for each MI sample interval.

Former transformer pad (CA3) – One surface MI sample (0-12 inches) was collected for analysis of PCBs from an area designated as MI-1. Thirty aliquots were collected within 2 feet of the concrete pad.

Launch Area – Soil samples were collected from 24 discrete locations (soil borings SB-1 through SB-7 and SB-12 through SB-28) and three MI areas (MI-1, MI-2, and MI-3) to address seven AOCs. Soil samples were not collected from soil borings SB-8, SB-9, SB-10, and SB-11, as their only purpose was for installation of background monitoring wells MW-8, MW-9, MW-10, and MW-11.

Former Missile Assembly and Test Building Area (LA1) – One soil boring (SB-1) was advanced with augers equipped with split-spoon samplers to a depth of 18 feet bgs. Three soil samples were collected from SB-1 (1 to 3 feet, 3 to 5 feet, and 11 to 13 feet) for analysis of TAL metals, pH, SVOCs, and VOCs. One DPT soil boring (SB-16) was advanced to a depth of 2 feet bgs. One soil sample, from just below the asphalt pavement and gravel base (1 to 2 feet), was collected from SB-16 for analysis of TAL metals, pH, and VOCs. Soil boring SB-18 was advanced to collect three Shelby tubes (1 to 3 feet, 3 to 5 feet, and 5 to 7 feet) for analysis of engineering properties.

Former Missile Magazine Area (LA2) – Four soil borings (SB-2, SB-3, SB-4, and SB-5) were advanced with augers equipped with split-spoon samplers. Soil borings SB-2 and SB-3 were drilled to a depth of 31 feet bgs. Soil boring SB-4 was drilled to 25 feet bgs, and soil boring SB-5 was drilled to 35 feet bgs. DPT was used to advance two soil borings (SB-13 and SB-14) to 24 feet bgs. Soil samples were collected immediately above groundwater (ranging from 17 to 23 feet bgs) and from 23 to 25 feet bgs near the footer drains associated with the magazines. Soil samples from this AOC were analyzed for TAL metals, pH, SVOCs, and VOCs. One sample from SB-3 was also analyzed for PCBs. Soil boring SB-26 was advanced to collect a Shelby tube from 25 to 27 feet bgs for the analysis of engineering properties.

Former Acid Fueling Area (LA3) – Three soil borings (SB-6, SB-23, and SB-24) were advanced with augers equipped with split-spoon samplers to collect soil samples from the graveled trench. Soil boring SB-6 was drilled to 18 feet bgs. Three samples were collected from SB-6 (0 to 1 foot, 6 to 8 feet, and 12 to 14 feet). Soil borings SB-23 and SB-24 were drilled to 8 feet bgs. Soil samples were collected from 0 to 1 foot and 6 to 8 feet in SB-23 and SB-24. Soil samples from this AOC were analyzed for TAL metals, pH, SVOCs, VOCs, and nitrate. Soil boring SB-25 was advanced to collect a Shelby tube immediately below the gravel fill from 6 to 8 feet for the analysis of engineering properties.

Former septic system/leach field (LA4) – One soil boring (SB-7) was advanced to a depth of 17 feet bgs with an auger rig equipped with split-spoon samplers. Three samples were collected from SB-7 (4 to 6 feet, 6 to 8 feet, and 10 to 12 feet). Four soil borings (SB-19, SB-20, SB-21, and SB-22) were sampled with a hand auger near the leach lines to a depth of 4 feet. Samples from this AOC were analyzed for TAL metals, pH, SVOCs, and VOCs. The soil sample from SB-20 was also analyzed for PCBs, pesticides, and herbicides. Soil boring SB-12 was advanced to collect a Shelby tube from 6 to 8 feet for analysis of engineering properties.

Suspected solid waste disposal area on the adjacent hillside (LA5) – Four MI samples were collected for analysis of TAL metals, pH, and SVOCs from areas designated MI-1 and MI-2, which were each centered on two drum shells located on the hillside. Surface (0-12 inches) and subsurface (1-2 feet) soil samples were collected with a soil probe. A planned completion depth of 3 feet for the subsurface MI samples could not be achieved due to the presence of weathered rock and tree roots at these locations. Nine aliquots were collected for each MI sample. Two surface and two subsurface grab samples were collected from sample locations (SB-27 and SB-28) within the MI-1 and MI-2 areas for VOC analysis.

Former transformer pad (LA6) – One DPT soil boring (SB-15) was installed to a depth of 3 feet bgs. Soil samples from the 1- to 2-foot and 2- to 3-foot intervals were submitted for analysis of PCBs.

Former Acid Storage Shed (LA7) – Two MI samples were collected for analysis of TAL metals, pH, and nitrate from an area designated as MI-3. Surface (0-12 inches) and subsurface (1-3 feet) soil samples were collected with a soil probe. Thirty aliquots for each sample interval were collected within 2 feet of the concrete pad. Soil boring (SB-17) was advanced to collect a Shelby tube from 0 to 2 feet for the analysis of engineering properties.

Background Area (LAB) – Eight surface soil samples (0-12 inches) were collected with a soil probe from a designated background area at the Launch Area (SB-33 through SB-40). Background soil samples were analyzed for TAL metals and SVOCs.

Figure 3-3 shows all soil sampling locations at the Control Area. Figure 3-4 shows all soil sampling locations at the Launch Area. Both soil boring and MI locations are shown on the figures.

The soil types from the soil borings were logged to document soil type and lithologic features. Soil at the Control Area consisted of brown to gray silty clay underlain by weathered shale at 8 feet bgs. Soil at the Launch Area varied across the property but generally consisted of alternating layers of gray clay, gray silt, and gray fine sand. In some of the deeper soil borings, weathered red sandstone was encountered at approximately 30 feet bgs. Moisture content generally increased with depth. Soil boring logs for both drilled and hand sample locations are in Appendix F.

Eight samples were collected and analyzed for engineering properties within the former UST area at the Control Area and at the former Missile Assembly and Test Building, former Missile Magazine Area, former Acid Fueling Area, former septic system/leach field, and former Acid Storage Shed at the Launch Area. Geotechnical analyses for engineering properties included moisture content, grain size, Atterburg limits, unified soil classification, specific gravity, pH, and fraction organic carbon using standard ASTM methods. The laboratory reports for engineering properties are included in Appendix F.

Field screening of all soil samples was completed with a properly calibrated RAE Systems® photoionization detector (PID) with four-gas monitor (EntryRAE). Field screen measurements of soil samples indicated readings of 0 parts per million (ppm) at most sample locations. PID readings between 20 and 24 ppm were recorded in soil samples collected from borings SB-15 (LA6) and SB-16 (LA1). PID reading measurements for each discrete sample interval are presented on the corresponding drilling log for each sample location (Appendix F).

Decontamination procedures were followed as prescribed in the SAP. Non-aqueous-phase liquid was not encountered in any of the boreholes. Upon completion of sampling, each borehole was properly abandoned using Holeplug® bentonite pellets. Abandoned boreholes were finished with concrete if located in paved areas. Abandoned boreholes in non-paved areas were finished with soil.

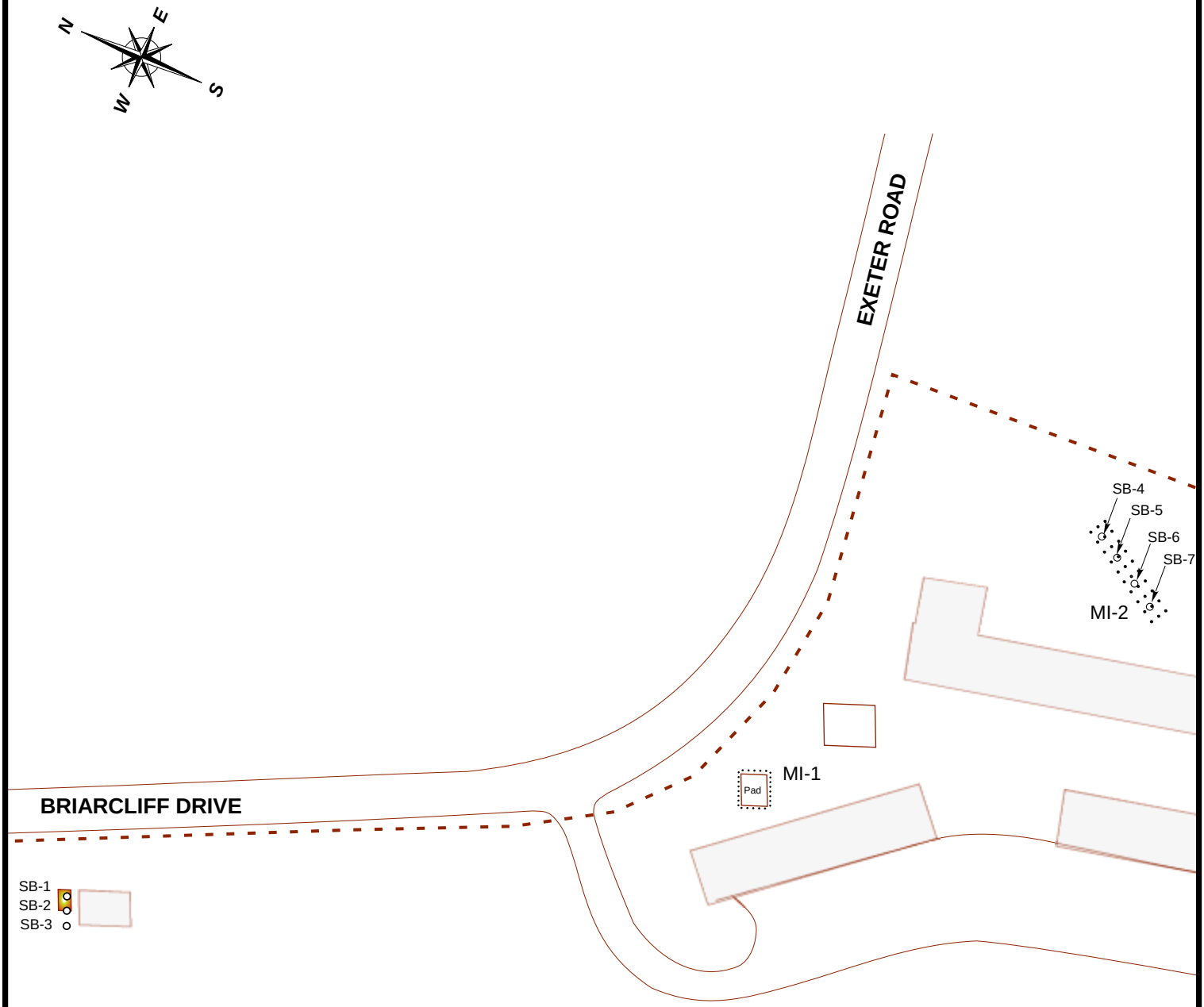


FIGURE 3-3
SI SOIL SAMPLE LOCATIONS

FORMER CONTROL AREA
NIKE SITE CL-48
GARFIELD HEIGHTS, OHIO

DATE: 11/19/2009
DRAWN BY: JS/JP

SOURCE: GOOGLE EARTH
NOT TO SCALE

LEGEND

SB-13 — SOIL BORING

MI-2 — MULTI-INCREMENTAL SAMPLING LOCATIONS

FENCE

TERRAINE
ENSAFE
8(a) joint venture

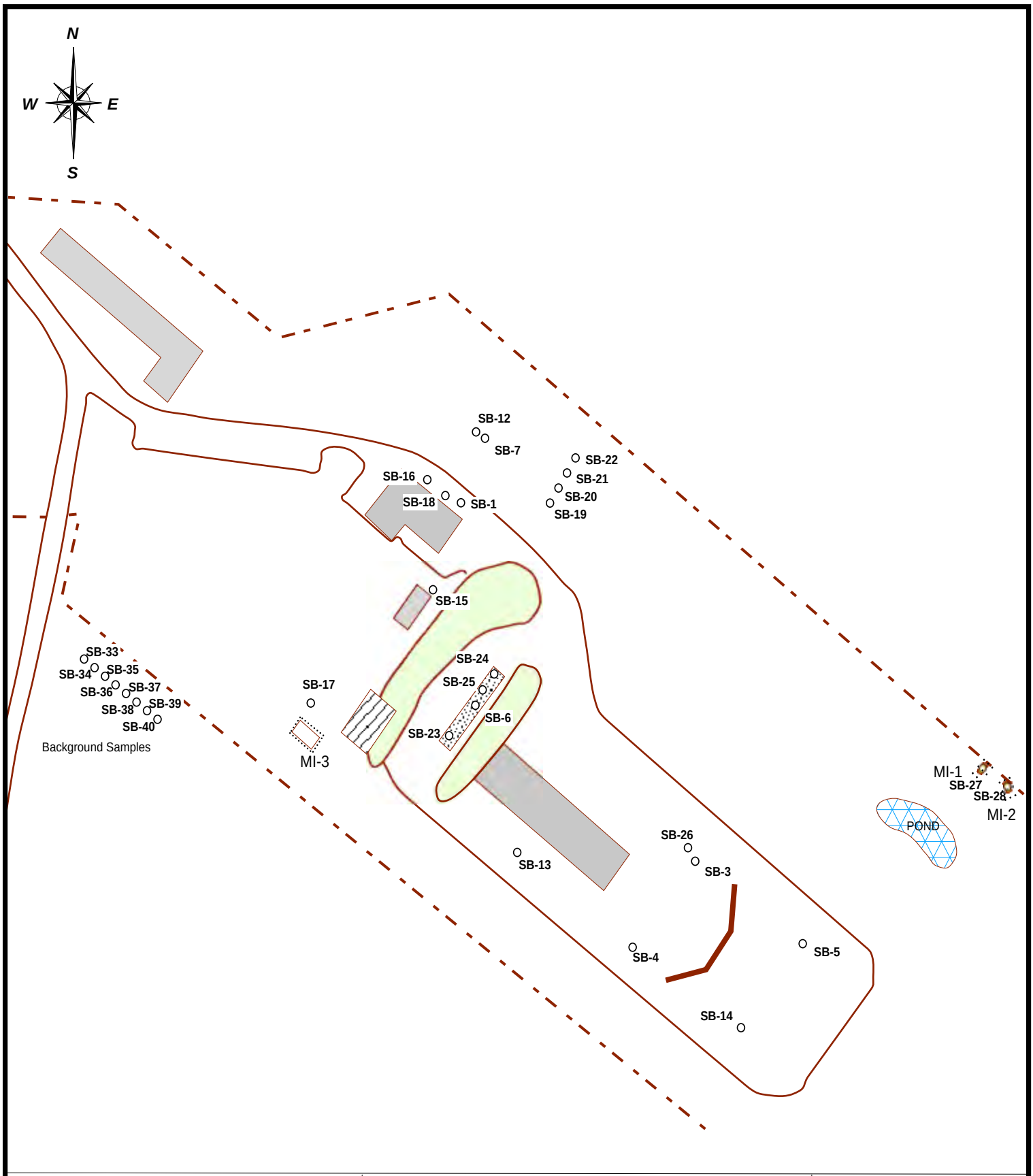


FIGURE 3-4
SI SOIL SAMPLE LOCATIONS

FORMER LAUNCH AREA
NIKE SITE CL-48
INDEPENDENCE, OHIO

DATE: 11/19/2009
DRAWN BY: JS/JP

SOURCE: GOOGLE EARTH
NOT TO SCALE

LEGEND

- - - - FENCE

MI-1 ∴ MULTI-INCREMENTAL SAMPLING LOCATIONS

SB-13 ○ SOIL BORING

TERRAINE
ENSAFE
8(a) joint venture

Soil samples were collected from properly decontaminated, stainless steel split-spoon samplers or dedicated, disposable acetate tube liners for DPT boreholes. Stainless steel spatulas and spoons were used to extract the soil sample from the samplers. Each soil sample collected in the course of the project was identified by a unique sample ID code. The sample ID protocol was detailed in the SAP. The code consists of 11 characters divided into four groupings with specific meanings. For example, the sample ID SB01S008CA1 is a sample collected from soil boring 1 (SB01), a soil sample (S), and from the 6- to 8-foot interval (008). The location and AOC number are represented by the last three characters – CA1 for the former gasoline UST at the Control Area. Duplicate soil samples are represented by a "C" in the fifth character location.

Samples were immediately placed in properly labeled sample jars and then placed in coolers containing ice. Each sample was recorded on the COC. A TA courier picked up sample coolers and COCs for transport to the laboratory, as requested by the TEJV Field Team. Communication with the laboratory was conducted on a daily basis. QA samples were shipped via FedEx overnight delivery to CT Laboratories in Baraboo, Wisconsin. A summary chart of all collected samples, broken down by AOC, is included in Appendix C.

3.4 Monitoring Well Installation and Groundwater Sampling

Groundwater monitoring wells were installed during the SI in the locations identified in the SAP. Monitoring well installation was conducted 10 to 23 November 2008. No monitoring wells were planned or installed at the Control Area. Soil borings SB-1 through SB-11 were drilled with a rubber-tracked CME® model L60 or an Acker Renegade® auger rig equipped with 8-inch outside diameter hollow-stem augers to allow for proper well installation. Upon reaching a sufficient completion depth, the soil borings were then converted to monitoring wells MW-1 through MW-11. One monitoring well (MW-1) was installed in the former Missile Assembly and Test Building area. Four monitoring wells (MW-2, MW-3, MW-4, and MW-5) were installed in the former Missile Magazine Area. One monitoring well (MW-6) was installed in the former Acid Fueling Area. One monitoring well (MW-7) was installed near the former septic system/leach field. Four additional monitoring wells (MW-8, MW-9, MW-10, and MW-11) were installed to assess groundwater flow direction at the Launch Area. DTW varied across the Launch Area. Site geology and anthropogenic factors appear to affect the occurrence and flow of groundwater. Site hydrogeology is discussed in further detail in Section 5.3. The locations of the monitoring wells are shown on Figure 3-5.

During the SI, the locations of the three Envirodyne monitoring wells were noted. These monitoring wells were not sampled as part of the SI groundwater monitoring program.

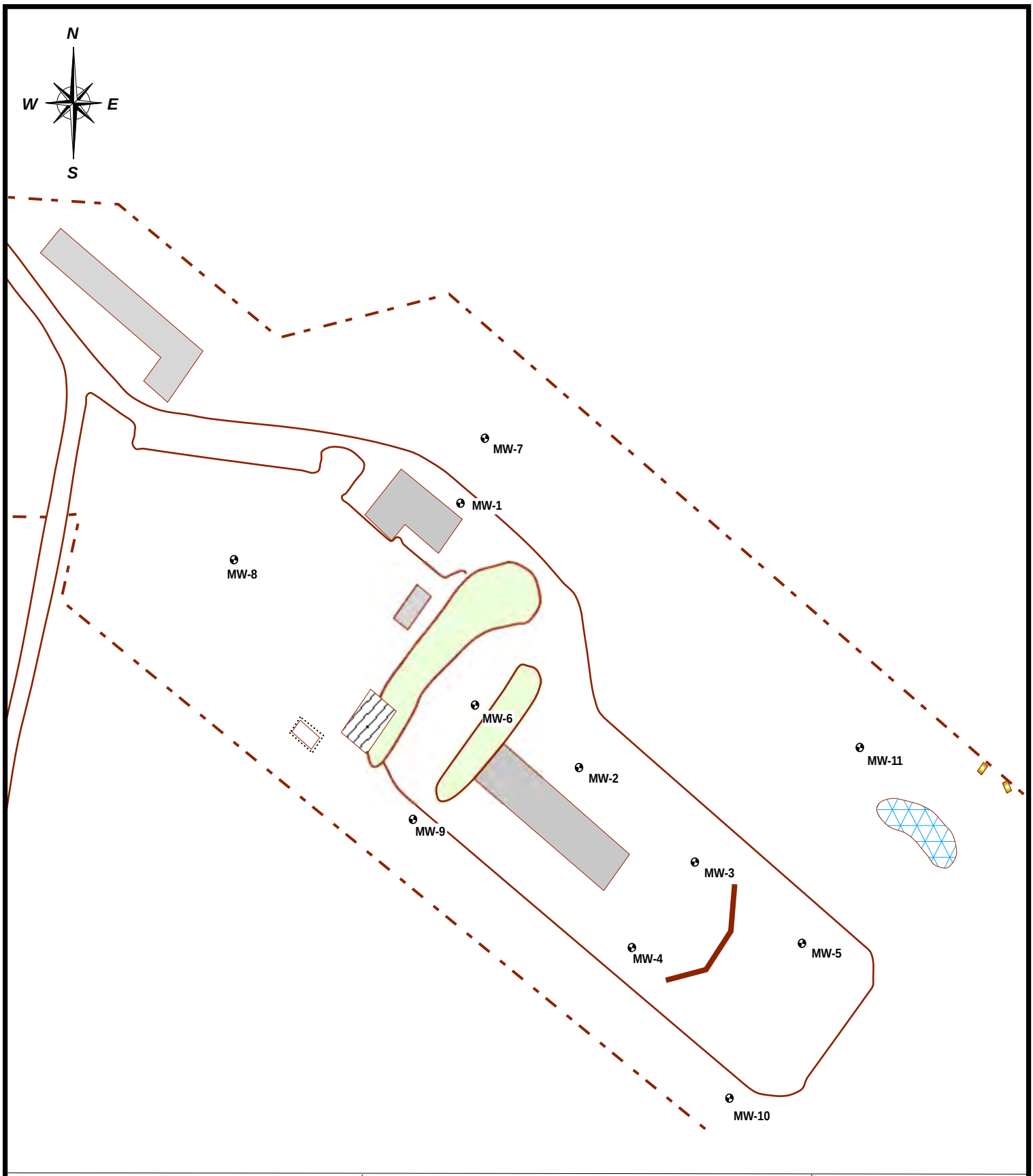


Figure 3-5
SI GROUNDWATER SAMPLE LOCATIONS
FORMER LAUNCH AREA
NIKE SITE CL-48
INDEPENDENCE, OHIO

DATE: 11/19/2009
DRAWN BY: JS/JP

SOURCE: GOOGLE EARTH
NOT TO SCALE

LEGEND

MW-9 GROUNDWATER MONITORING WELL

FENCE

TERRAINE ENSAFE 8(a) joint venture

Former Missile Assembly and Test Building Area (LA1) – Groundwater was encountered at approximately 14 feet bgs. Soil boring SB-1 was extended to a depth of 18 feet bgs and converted to monitoring well MW-1.

Former Missile Magazine Area (LA2) – Groundwater was encountered at approximately 20 feet bgs in soil borings SB-2 and SB-3. These borings were extended to a depth of 31 feet and converted to monitoring wells MW-2 and MW-3. Groundwater was encountered at approximately 22 feet bgs in soil boring SB-4, which was extended to 25 feet and converted to MW-4. Groundwater was encountered at approximately 25 feet bgs in soil boring SB-5, which was extended to a depth of 35 feet and converted to MW-5.

Former Acid Fueling Area (LA3) – Groundwater was encountered at approximately 14 feet bgs. Soil boring SB-6 was extended to a depth of 18 feet bgs and converted to monitoring well MW-6.

Former septic system/leach field (LA4) – Groundwater was encountered at approximately 14 feet bgs. Soil boring SB-7 was extended to a depth of 17 feet bgs and converted to monitoring well MW-7.

Site Monitoring Wells (LA0) – Four additional soil borings were drilled to install site monitoring wells to assess groundwater flow direction at the site. Boreholes were logged, but no soil samples were collected for analyses from these soil borings.

The soil boring for monitoring well MW-8 was drilled approximately 200 feet west of the former transformer building in the area of the proposed settling system based on a 1957 USACE site drawing. Saturated conditions were encountered at 18 feet bgs, and the borehole was extended to a depth of 21 feet. Well screen, casing, and filter material were placed in the borehole and left overnight to determine whether groundwater would build in the well. No water was present the following day, and the well materials were removed. The borehole was extended to 29 feet bgs. Again, saturated auger cuttings indicated the presence of groundwater. Monitoring well MW-8 was installed to a final depth of 29 feet.

The soil boring for monitoring well MW-9 was drilled approximately 100 feet south of the former Acid Fueling Area. Saturated conditions were encountered at 36 feet bgs, and the borehole was extended to a depth of 40 feet. Well screen, casing, and filter material were placed in the borehole and left overnight to determine whether groundwater would build in the well. No water was present the following day, and the borehole was extended to 48 feet bgs. However, monitoring

well MW-9 was installed to a final depth of only 46 feet to ensure that the sandy saturated zone was screened.

The soil boring for monitoring well MW-10 was drilled southeast of the Missile Magazines. Groundwater was encountered at approximately 33 feet bgs. Soil boring SB-10 was extended to a depth of 38 feet bgs and converted to monitoring well MW-10.

The soil boring for monitoring well MW-11 was drilled northeast and downslope of the Missile Magazines. Groundwater was encountered at approximately 8 feet bgs. Soil boring SB-11 was extended to a depth of 13 feet bgs and converted to monitoring well MW-11.

Monitoring wells were constructed of 2-inch-diameter Schedule 40 polyvinyl chloride (PVC) pipe with the lower 10 feet consisting of factory slotted (0.010-inch slot size) well screen. Only 7 feet of screen was installed in monitoring well MW-11 due to its shallow depth. The annular space surrounding the well screen was filled with clean silica sand to an elevation approximately 1 foot above the top of the well screen. The sand filter pack was topped with bentonite chips to approximately 2 feet above the top of the sand pack. The bentonite chips were then hydrated with distilled water. The remaining annular space was filled with cement grout and completed using flush-mount, bolt-down well covers set in 2-foot-square by approximately 4-inch-deep concrete pads. The pads were sloped to prevent water infiltration into the well cover. The top of the PVC well casing was fitted with an expandable, locking, water-tight cap. Well construction logs are included on the drill logs in Appendix F.

Monitoring well development was conducted 20 to 24 November 2008. The DTW was measured for each well to calculate the well volume. Groundwater was not present in monitoring wells MW-8 and MW-9. For the remaining nine monitoring wells, at least 10 well volumes were removed from each monitoring well or until the well went dry (MW-4 and MW-7). Removal of water was conducted at each well with the use of a bailer dedicated to each well. Development water was collected and managed as IDW in accordance with the SAP.

Groundwater samples were collected from 2 to 4 December 2008. Where DTW levels were sufficient, the micro-purge technique (low-flow sampling) was used to collect groundwater samples. Monitoring wells MW-1, MW-2, MW-3, MW-4, MW-6, MW-7, and MW-11 were sampled using this method. To monitor the representativeness of the water sample, the most sensitive parameters, including dissolved oxygen, oxidation-reduction potential, and turbidity, were measured along with

the traditional parameters of pH, temperature, and conductivity. Groundwater purging and sampling logs for each well are included in Appendix G.

The DTW levels were too deep within monitoring wells MW-5 and MW-10 to permit low-flow sampling; therefore, these wells were purged using new, dedicated, disposable bailers. Upon full recharge, groundwater samples were carefully collected with new, dedicated, disposable bailers. Groundwater was not present in monitoring wells MW-8 and MW-9, and, therefore, these wells could not be sampled.

Decontamination procedures were followed as prescribed in the SAP. Non-aqueous-phase liquid was not encountered in any of the monitoring wells. Upon completion of sampling, the well caps for each monitoring well were secured and locked. Manhole covers were tightly bolted down.

Each groundwater sample collected in the course of the project was identified by a unique sample ID code. The code consists of 11 characters divided into four groupings with specific meanings. For example, the sample ID MW01G001LA1 is a sample collected from monitoring well 1 (MW01), a groundwater sample (G), and the first sampling event (001). The location and AOC number are represented by the last three characters – LA1 for the former Missile Assembly and Test Building at the Launch Area. Duplicate groundwater samples are represented by an "H" in the fifth character location. The sample ID protocol is detailed in the SAP.

Samples were immediately placed in laboratory-prepared, properly labeled sample jars, which were placed in coolers containing ice. Each sample was recorded on the COC. A TA courier picked up sample coolers and COCs for transport to the laboratory, as requested by the TEJV Field Team. QA samples were shipped overnight to CT Laboratories on 3 December 2008. The TEJV contacted both TA and CT Laboratories and confirmed safe receipt of all samples on 5 December 2008. A summary chart of all collected samples, broken down by AOC, is included in Appendix C.

Groundwater samples were analyzed for VOCs, SVOCs, and TAL metals. The groundwater sample from the former Acid Fueling Area (MW-6) was also analyzed for nitrate. In addition to VOCs, SVOCs, and TAL metals, the groundwater sample from the former septic system/leach field (MW-7) was also analyzed for PCBs, pesticides, and herbicides.

3.5 Investigation-Derived Waste

The IDW generated during the SI consisted of soil cuttings; development and purged groundwater; decontamination liquids; disposable sampling equipment (acetate soil sample liners, plastic sheeting, etc.); and disposable personal protective equipment (PPE). During field activities, all IDW was assumed to be special waste and was managed accordingly. Soil IDW and water IDW samples were collected in November 2008 and analyzed by toxicity characteristic leaching procedure analysis for metals, VOCs, and SVOCs. Analytical results were submitted to Safety Kleen, Inc. All IDW was classified as non-hazardous and disposed of accordingly. IDW analytical results are included in Appendix H.

Auger cuttings and a small volume of soil generated during DPT sampling were composited and placed in 26 properly labeled 55-gallon drums. PPE and disposal sampling materials were placed in three 55-gallon drums. Since these drums also contained some soil, soil IDW results were used to classify all PPE material.

The majority of liquid IDW was generated during monitoring well development and decontamination procedures. Development water, decontamination liquids, and a small volume of water generated during groundwater sampling were composited and placed in six properly labeled 55-gallon drums and temporarily managed on the Site. Due to the possibility of freezing, the six drums were only filled two-thirds full.

The 35 drums of IDW from the Launch Area were temporarily placed at the eastern end of the parking lot at the Launch Area until analytical results were available. Upon inspection of the drums in January 2009, it was discovered that the six drums containing liquid had bulged due to an extended time period of sub-freezing temperatures, in spite of precautions (e.g., leaving room for expansion). The drums were full, and signs of leakage were not observed. Because the integrity of the drums was compromised, the six liquid-containing drums were overpacked before transport. All IDW was removed from the Site by Safety-Kleen on 20 January 2009 under proper manifest requirements and disposed of offsite in accordance with its characterization status and federal and state regulations. The manifests are included in Appendix H. No IDW generated during the SI remains on the Site.

3.6 Soil Analytical Results Summary

Tables 3-2 through 3-11 present a summary of detected constituents by AOC for soil samples collected at the Control and Launch Areas. The USEPA Regional Screening Levels for residential soil (EPARSL RS), adjusted by a factor of 0.1 (for non-carcinogens) in accordance with USEPA screening guidance (USEPA, 2008), are shown for each analyte detected. Table 3-12 presents a summary of detected constituents within the background area. The minimum, maximum, and calculated concentrations for detected analytes in background soil samples are shown. Those constituents with background maximum values greater than the EPARSL RS are highlighted on Table 3-12. Although the statistically calculated background values (upper confidence level [UCL]) are included, they were not used for comparison during the screening process because UCLs exceeded the maximum value reported in background screening samples. The highest screening levels (either EPARSL RS or maximum background) are shown in bold on Tables 3-2 through 3-11 to indicate which value was used for comparison to detected analyte concentrations within the AOCs. Analyte concentrations exceeding the screening level are highlighted and retained as potential COPCs for the AOC. A detailed discussion of the screening levels used for the soil data assessment is in Section 3.8. Complete analytical results for all soil samples are in Appendix D, and the DVR is in Appendix E. Background soil results are discussed in Section 4.1. Further evaluation of COPCs is presented in Sections 4 and 8.

Geotechnical analyses of eight soil samples included moisture content, grain size, Atterburg limits, unified soil classification, specific gravity, pH, and fraction organic carbon using standard ASTM methods. Based on the laboratory results of the eight samples, soil at the former Nike Site CL-48 consists primarily of clay and silt. Moisture content ranged from 15.8 to 29.8 percent. Moisture content generally increased with depth. Soil pH ranged from 6.5 to 8.9. Organic content ranged from 1.3 to 2.6 percent. A summary table of engineering properties results is included in Appendix F along with the laboratory reports.

Table 3-2
Nike Site CL-48 Site Inspection
Former UST Area (CA1)
Detected Constituents - Soil

							Sample Location:	SB01-CA1	SB01-CA1	SB02-CA1
							Sample ID:	SB01C008CA1	SB01S008CA1	SB02S008CA1
							Sample Date:	11/18/2008	11/18/2008	11/18/2008
							Sample Type:	FD	N	N
							Matrix:	SO	SO	SO
							Depth (feet):	6-8	6-8	6-8
Method	**CAS No.**	**Analyte**	**EPARSL RS**	**BKGRND MIN**	**BKGRND MAX**	**BKGRND CALC**	**Units**			
SW6010	7439-92-1	Lead	**400**	33	67	95.18	mg/kg	120 J	39 J	20 J
SW8260	78-93-3	2-Butanone (MEK)	**2800**				mg/kg	-	0.012	-
SW8260	67-64-1	Acetone	**6100**				mg/kg	0.032 J	0.047 J	0.042 J

Notes:

SO = soil sample
FD = field duplicate sample
N = normal (primary) sample
EPARSL RS = USEPA Regional Screening Level for Residential Soil, September 12, 2008
BKGRND MIN = Background Minimum Value
BKGRND MAX = Background Maximum Value
BKGRND CALC = Background Calculated Value as calculated in Appendix I
Dash (-) indicates analyte undetected in that sample
Analytes not listed were undetected in all samples
Samples not listed were undetected for all analytes

mg/kg = milligrams per kilogram
NV = No Value
su = standard units (pH)
J = estimated value
NA = sample was not analyzed for the analyte indicated
See Table 2-1 for list of required analytes for this AOC

Bold indicates the screening value used for comparison to results (EPARSL RS **or** Maximum Background)

= Result is above screening value for analyte

Analyte = Constituent of Potential Concern for AOC

Table 3-3
Nike Site CL-48 Site Inspection
Suspected Solid Waste Disposal Area on the Hillside (CA2)
Detected Constituents – Soil

							Sample Location:	MI02-CA2	MI02-CA2	SB04-CA2	SB04-CA2	SB05-CA2	SB05-CA2	SB06-CA2	SB06-CA2	SB07-CA2	SB07-CA2
							Sample ID:	MI02S001CA2	MI02S002CA2	SB04S001CA2	SB04S002CA2	SB05S001CA2	SB05S002CA2	SB06S001CA2	SB06S002CA2	SB07S001CA2	SB07S002CA2
							Sample Date:	11/23/2008	11/23/2008	11/23/2008	11/23/2008	11/23/2008	11/23/2008	11/23/2008	11/23/2008	11/23/2008	11/23/2008
							Sample Type:	N	N	N	N	N	N	N	N	N	N
								SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
							Depth (feet):	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2
Method	**CAS No.**	**Analyte**	**EPARSL RS**	**BKGRND MIN**	**BKGRND MAX**	**BKGRND CALC**	**Units**										
SW6010	7429-90-5	**Aluminum**	7700	8500	**10000**	10762	mg/kg	10000 J	11000 J	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7440-36-0	Antimony	**3.1**	0.38	0.77	1.01	mg/kg	0.48 J	0.59 J	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7440-38-2	Arsenic	0.39	12	**26**	29.05	mg/kg	12 J	13 J	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7440-39-3	Barium	**1500**	36	67	81.03	mg/kg	34	34	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7440-41-7	Beryllium	**16**	0.52	0.67	0.769	mg/kg	0.65	0.66	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7440-43-9	Cadmium	**7**	0.042	0.15	0.243	mg/kg	0.23	0.13 J	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7440-70-2	Calcium	**NV**	370	1100	1559	mg/kg	2400 J	1600 J	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7440-47-3	Chromium	**280**	11	15	16.54	mg/kg	40	35	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7440-48-4	**Cobalt**	2.3	6.1	**7.7**	8.319	mg/kg	10	12	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7440-50-8	Copper	**310**	19	28	31.6	mg/kg	28	24	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7439-89-6	Iron	5500	19000	**27000**	29951	mg/kg	26000 J	25000 J	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7439-92-1	Lead	**400**	33	67	95.18	mg/kg	44	39	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7439-95-4	Magnesium	**NV**	1400	2000	2238	mg/kg	1800	1800	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7439-96-5	Manganese	180	240	**440**	537.2	mg/kg	220 J	210 J	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7439-98-7	Molybdenum	**39**	3.3	5.7	6.398	mg/kg	3.1	2.7	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7440-02-0	Nickel	**160**	16	21	22.69	mg/kg	32	34	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7440-09-7	Potassium	**NV**	550	770	830.7	mg/kg	2100 J	1900 J	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7782-49-2	Selenium	**39**	1	1.4	1.676	mg/kg	0.66 J	0.5 J	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7440-22-4	Silver	**39**				mg/kg	0.72	0.5	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7440-62-2	Vanadium	**55**	20	25	25.97	mg/kg	16	17	NA	NA	NA	NA	NA	NA	NA	NA
SW6010	7440-66-6	Zinc	**2300**	60	95	111.8	mg/kg	180 J	120 J	NA	NA	NA	NA	NA	NA	NA	NA
SW7471	7439-97-6	**Mercury**	**0.67**	0.036	0.068	0.0908	mg/kg	0.84	0.54	NA	NA	NA	NA	NA	NA	NA	NA
SW8260	67-64-1	Acetone	**6100**				mg/kg	NA	NA	-	-	-	-	-	-	-	0.0087 J
SW8270	91-57-6	2-Methylnaphthalene	**31**				mg/kg	0.048 J	0.053 J	NA	NA	NA	NA	NA	NA	NA	NA
SW8270	83-32-9	Acenaphthene	**340**				mg/kg	0.018 J	0.013 J	NA	NA	NA	NA	NA	NA	NA	NA
SW8270	120-12-7	Anthracene	**1700**	0.0077	0.01	0.01099	mg/kg	0.074 J	0.031 J	NA	NA	NA	NA	NA	NA	NA	NA
SW8270	56-55-3	**Benzo(a)anthracene**	**0.15**	0.024	0.052	0.07301	mg/kg	0.44	0.16	NA	NA	NA	NA	NA	NA	NA	NA
SW8270	50-32-8	**Benzo(a)pyrene**	0.015	0.025	**0.059**	0.08732	mg/kg	0.35	0.15	NA	NA	NA	NA	NA	NA	NA	NA
SW8270	205-99-2	**Benzo(b)fluoranthene**	**0.15**	0.04	0.097	0.1357	mg/kg	0.48	0.22	NA	NA	NA	NA	NA	NA	NA	NA
SW8270	191-24-2	Benzo(g,h,i)perylene	**170**	0.021	0.046	0.06756	mg/kg	0.26	0.14	NA	NA	NA	NA	NA	NA	NA	NA
SW8270	207-08-9	Benzo(k)fluoranthene	**1.5**	0.013	0.04	0.05595	mg/kg	0.23 J	0.098 J	NA	NA	NA	NA	NA	NA	NA	NA
SW8270	65-85-0	Benzoic acid	**24000**	0.42	4.4	6.585	mg/kg	0.75 J	0.57 J	NA	NA	NA	NA	NA	NA	NA	NA
SW8270	117-81-7	bis(2-Ethylhexyl)phthalate	**35**				mg/kg	0.18 J	-	NA	NA	NA	NA	NA	NA	NA	NA
SW8270	86-74-8	Carbazole	**NV**				mg/kg	0.038 J	-	NA	NA	NA	NA	NA	NA	NA	NA
SW8270	218-01-9	Chrysene	**15**	0.029	0.073	0.1052	mg/kg	0.42	0.18	NA	NA	NA	NA	NA	NA	NA	NA
SW8270	84-74-2	Di-n-butylphthalate	**610**				mg/kg	0.036 J	0.035 J	NA	NA	NA	NA	NA	NA	NA	NA
SW8270	53-70-3	**Dibenz(a,h)anthracene**	**0.015**	0.011	0.012	0.01228	mg/kg	0.064	0.034	NA	NA	NA	NA	NA	NA	NA	NA

Table 3-3 – continued
Nike Site CL-48 Site Inspection
Suspected Solid Waste Disposal Area on the Hillside (CA2)
Detected Constituents – Soil

							Sample Location:	MI02-CA2	MI02-CA2	SB04-CA2	SB04-CA2	SB05-CA2	SB05-CA2	SB06-CA2	SB06-CA2	SB07-CA2	SB07-CA2
							Sample ID:	MI02S001CA2	MI02S002CA2	SB04S001CA2	SB04S002CA2	SB05S001CA2	SB05S002CA2	SB06S001CA2	SB06S002CA2	SB07S001CA2	SB07S002CA2
							Sample Date:	11/23/2008	11/23/2008	11/23/2008	11/23/2008	11/23/2008	11/23/2008	11/23/2008	11/23/2008	11/23/2008	11/23/2008
							Sample Type:	N	N	N	N	N	N	N	N	N	N
								SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
							Depth (feet):	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2
Method	**CAS No.**	**Analyte**	**EPARSL RS**	**BKGRND MIN**	**BKGRND MAX**	**BKGRND CALC**	**Units**										
SW8270	206-44-0	Fluoranthene	**230**	0.056	0.14	0.2077	mg/kg	0.87 J	0.34 J	NA	NA	NA	NA	NA	NA	NA	NA
SW8270	193-39-5	**Indeno(1,2,3-cd)pyrene**	**0.15**	0.018	0.042	0.06105	mg/kg	0.24 J	0.11 J	NA	NA	NA	NA	NA	NA	NA	NA
SW8270	91-20-3	Naphthalene	**3.9**	0.0082	0.011	0.01363	mg/kg	0.01 J	0.02 J	NA	NA	NA	NA	NA	NA	NA	NA
SW8270	85-01-8	Phenanthrene	**170**	0.03	0.073	0.09326	mg/kg	0.25	0.17	NA	NA	NA	NA	NA	NA	NA	NA
SW8270	129-00-0	Pyrene	**170**	0.046	0.11	0.1434	mg/kg	0.7 J	0.27 J	NA	NA	NA	NA	NA	NA	NA	NA
SW9045	PH	pH					su	5.95 J	5.63 J	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

SO	= soil sample
FD	= field duplicate sample
N	= normal (primary) sample
EPARSL RS	= USEPA Regional Screening Level for Residential Soil, September 12, 2008
BKGRND MIN	= Background Minimum Value
BKGRND MAX	= Background Maximum Value
BKGRND CALC	= Background Calculated Value as calculated in Appendix I
mg/kg	= milligrams per kilogram
NV	= No Value
su	= standard units (pH)
J	= estimated value
NA	= sample was not analyzed for the analyte indicated
	See Table 2-1 for list of required analytes for this AOC

Dash (-) indicates analyte undetected in that sample
Analytes not listed were undetected in all samples
Samples not listed were undetected for all analytes

Bold indicates the screening value used for comparison to results (EPARSL RS **or** Maximum Background)

= Result is above screening value for analyte

Analyte = Constituent of Potential Concern for AOC

Table 3-4
Nike Site CL-48 Site Inspection
Former Transformer Pad (CA3)
Detected Constituents - Soil

Sample Location:	MI01-CA3
Sample ID:	MI01S001CA3
Sample Date:	11/18/2008
Sample Type:	N
Matrix:	SO
Depth (feet):	0-1

Method	CAS No.	Analyte	EPARSL RS	BKGRND MIN	BKGRND MAX	BKGRND CALC	Units	
SW8082	11097-69-1	Aroclor-1254	**0.22**				mg/kg	0.035 J

Notes:

SO	= soil sample
FD	= field duplicate sample
N	= normal (primary) sample
EPARSL RS	= USEPA Regional Screening Level for Residential Soil, September 12, 2008
BKGRND MIN	= Background Minimum Value
BKGRND MAX	= Background Maximum Value
BKGRND CALC	= Background Calculated Value as calculated in Appendix I
mg/kg	= milligrams per kilogram
NV	= No Value
su	= standard units (pH)
J	= estimated value
NA	= sample was not analyzed for the analyte indicated
	See Table 2-1 for list of required analytes for this AOC

Dash (-) indicates analyte undetected in that sample

Analytes not listed were undetected in all samples

Samples not listed were undetected for all analytes

Bold indicates the screening value used for comparison to results (EPARSL RS **or** Maximum Background)

= Result is above screening value for analyte

Analyte = Constituent of Potential Concern for AOC

Table 3-5
Nike Site CL-48 Site Inspection
Former Missile Assembly and Test Building Area (LA1)
Detected Constituents – Soil

							Sample Location:	SB01-LA1	SB01-LA1	SB01-LA1	SB01-LA1	SB16-LA1
							Sample ID:	SB01C005LA1	SB01S003LA1	SB01S005LA1	SB01S013LA1	SB16S002LA1
							Sample Date:	11/20/2008	11/20/2008	11/20/2008	11/20/2008	11/17/2008
							Sample Type:	FD	N	N	N	N
							Matrix:	SO	SO	SO	SO	SO
							Depth (feet):	3-5	1-3	3-5	11-13	1-2
Method	**CAS No.**	**Analyte**	**EPARSL RS**	**BKGRND MIN**	**BKGRND MAX**	**BKGRND CALC**	**Units**					
SW6010	7429-90-5	**Aluminum**	7700	8500	**10000**	10762	mg/kg	9400	11000	9400	9500	8300 J
SW6010	7440-36-0	Antimony	**3.1**	0.38	0.77	1.01	mg/kg	-	0.45 J	-	-	0.61 J
SW6010	7440-38-2	Arsenic	0.39	12	**26**	29.05	mg/kg	13	13	11	10	12 J
SW6010	7440-39-3	Barium	**1500**	36	67	81.03	mg/kg	34	89	45	29	44 J
SW6010	7440-41-7	Beryllium	**16**	0.52	0.67	0.769	mg/kg	0.44 J	0.57	0.44 J	0.47	0.48
SW6010	7440-70-2	Calcium	**NV**	370	1100	1559	mg/kg	590	2100	700	33000	1900 J
SW6010	7440-47-3	Chromium	**280**	11	15	16.54	mg/kg	11	16	11	15	13 J
SW6010	7440-48-4	**Cobalt**	2.3	6.1	**7.7**	8.31	mg/kg	14	9.5	7.8	10	7.6 J
SW6010	7440-50-8	Copper	**310**	19	28	31.6	mg/kg	27	30	27	24	24
SW6010	7439-89-6	**Iron**	5500	19000	**27000**	29951	mg/kg	25000	29000	23000	26000	24000 J
SW6010	7439-92-1	Lead	**400**	33	67	95.18	mg/kg	14	15	12	13	15
SW6010	7439-95-4	Magnesium	**NV**	1400	2000	2238	mg/kg	1800	2900	1900	12000	2300
SW6010	7439-96-5	**Manganese**	180	240	**440**	537.2	mg/kg	780	510	450	460	310 J
SW6010	7439-98-7	Molybdenum	**39**	3.3	5.7	6.398	mg/kg	2.7	3	2.5	1.8	3.3
SW6010	7440-02-0	Nickel	**160**	16	21	22.69	mg/kg	16	24	16	25	20 J
SW6010	7440-09-7	Potassium	**NV**	550	770	830.7	mg/kg	790	920	890	1900	760 J
SW6010	7782-49-2	Selenium	**39**	1	1.4	1.676	mg/kg	-	-	-	-	1.4
SW6010	7440-62-2	Vanadium	**55**	20	25	25.97	mg/kg	18	22	18	18	17 J
SW6010	7440-66-6	Zinc	**2300**	60	95	111.8	mg/kg	61	64	64	57	62
SW7471	7439-97-6	Mercury	**0.67**	0.036	0.068	0.0908	mg/kg	-	0.041	-	-	0.023 J
SW8260	67-64-1	Acetone	**6100**				mg/kg	0.0071 J	NA	0.0057 J	0.0072 J	-
SW8260	75-09-2	Methylene chloride	**11**				mg/kg	-	NA	-	-	0.01
SW8270	83-32-9	Acenaphthene	**340**				mg/kg	-	0.011 J	-	-	NA
SW8270	120-12-7	Anthracene	**1700**	0.0077	0.01	0.01099	mg/kg	-	0.25	-	-	NA
SW8270	56-55-3	Benzo(a)anthracene	**0.15**	0.024	0.052	0.07301	mg/kg	-	0.1	0.023 J	-	NA
SW8270	50-32-8	**Benzo(a)pyrene**	0.015	0.025	**0.059**	0.08732	mg/kg	-	0.096	0.027 J	-	NA
SW8270	205-99-2	Benzo(b)fluoranthene	**0.15**	0.04	0.097	0.1357	mg/kg	-	0.15	0.04	-	NA
SW8270	191-24-2	Benzo(g,h,i)perylene	**170**	0.021	0.046	0.06756	mg/kg	-	0.087	0.028 J	0.017 J	NA
SW8270	207-08-9	Benzo(k)fluoranthene	**1.5**	0.013	0.04	0.05595	mg/kg	-	0.07	-	-	NA
SW8270	86-74-8	Carbazole	**NV**				mg/kg	-	0.11 J	-	-	NA
SW8270	218-01-9	Chrysene	**15**	0.029	0.073	0.1052	mg/kg	-	0.13	0.029 J	0.018 J	NA
SW8270	53-70-3	**Dibenz(a,h)anthracene**	**0.015**	0.011	0.012	0.01228	mg/kg	-	0.023 J	0.0069 J	-	NA
SW8270	206-44-0	Fluoranthene	**230**	0.056	0.14	0.2077	mg/kg	-	0.27	0.059	-	NA
SW8270	86-73-7	Fluorene	**230**				mg/kg	-	0.026 J	-	-	NA
SW8270	193-39-5	Indeno(1,2,3-cd)pyrene	**0.15**	0.018	0.042	0.06105	mg/kg	-	0.067	0.022 J	-	NA
SW8270	91-20-3	Naphthalene	**3.9**	0.0082	0.011	0.01363	mg/kg	-	0.035 J	-	-	NA
SW8270	85-01-8	Phenanthrene	**170**	0.03	0.073	0.09326	mg/kg	-	0.16	0.031 J	0.029 J	NA
SW8270	129-00-0	Pyrene	**170**	0.046	0.11	0.1434	mg/kg	-	0.21	0.047	0.014 J	NA
SW9045	PH	pH					su	5.12 J	8.62 J	7.64 J	8.35 J	8.18 J

Table 3-5 – continued
Nike Site CL-48 Site Inspection
Former Missile Assembly and Test Building Area (LA1)
Detected Constituents – Soil

Notes:

SO	= soil sample
FD	= field duplicate sample
N	= normal (primary) sample
EPARSL RS	= USEPA Regional Screening Level for Residential Soil, September 12, 2008
BKGRND MIN	= Background Minimum Value
BKGRND MAX	= Background Maximum Value
BKGRND CALC	= Background Calculated Value as calculated in Appendix I
mg/kg	= milligrams per kilogram
NV	= No Value
su	= standard units (pH)
J	= estimated value
NA	= sample was not analyzed for the analyte indicated
	See Table 2-1 for list of required analytes for this AOC

Dash (-) indicates analyte undetected in that sample
Analytes not listed were undetected in all samples
Samples not listed were undetected for all analytes

Bold indicates the screening value used for comparison to results (EPARSL RS **or** Maximum Background)

= Result is above screening value for analyte

Analyte = Constituent of Potential Concern for AOC

Table 3-6
Nike Site CL-48 Site Inspection
Former Missile Magazine Area (LA2)
Detected Constituents – Soil

							Sample Location:	SB02-LA2	SB02-LA2	SB03-LA2	SB03-LA2	SB04-LA2	SB04-LA2	SB05-LA2	SB05-LA2	SB13-LA2	SB14-LA2
							Sample ID:	SB02S019LA2	SB02S025LA2	SB03S019LA2	SB03S025LA2	SB04S021LA2	SB04S025LA2	SB05S023LA2	SB05S025LA2	SB13S024LA2	SB14S024LA2
							Sample Date:	11/14/2008	11/14/2008	11/13/2008	11/13/2008	11/13/2008	11/13/2008	11/10/2008	11/10/2008	11/17/2008	11/18/2008
							Sample Type:	N	N	N	N	N	N	N	N	N	N
							Matrix:	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
							Depth (feet):	17-19	23-25	17-19	23-25	19-21	23-25	21-23	23-25	22-24	22-24
Method	**CAS No.**	**Analyte**	**EPARSL RS**	**BKGRND MIN**	**BKGRND MAX**	**BKGRND CALC**	**Units**										
SW6010	7429-90-5	Aluminum	7700	8500	**10000**	10762	mg/kg	6400 J	8200 J	10000 J	5700 J	7800 J	7200 J	5400 J	7600 J	6100 J	4200 J
SW6010	7440-36-0	Antimony	**3.1**	0.38	0.77	1.01	mg/kg	1.6 J	0.53 J	0.32 J	-	-	0.41 J	0.4 J	-	-	-
SW6010	7440-38-2	Arsenic	0.39	12	**26**	29.05	mg/kg	9.7 J	13 J	11	14	12	12	10	11	9.1 J	12
SW6010	7440-39-3	Barium	**1500**	36	67	81.03	mg/kg	30 J	43 J	55	32	45	49	30	40	28 J	23
SW6010	7440-41-7	Beryllium	**16**	0.52	0.67	0.769	mg/kg	0.39 J	0.59	0.53	0.29 J	0.51	0.41 J	0.28 J	0.39 J	0.34 J	0.25 J
SW6010	7440-43-9	Cadmium	**7**	0.042	0.15	0.243	mg/kg	0.037 J	0.18 J	-	0.074 J	-	0.038 J	0.078 J	-	0.086 J	0.077 J
SW6010	7440-70-2	Calcium	**NV**	370	1100	1559	mg/kg	7900 J	22000 J	31000 J	29000 J	5200 J	29000 J	27000 J	28000 J	33000 J	26000 J
SW6010	7440-47-3	Chromium	**280**	11	15	16.54	mg/kg	10 J	13 J	15	8.9	12	11	8.5	12	9.4 J	6.5
SW6010	7440-48-4	**Cobalt**	2.3	6.1	**7.7**	8.31	mg/kg	7.1 J	8.5 J	10	7.5	8.4	7.9	7	8.4	7.8 J	6.4
SW6010	7440-50-8	Copper	**310**	19	28	31.6	mg/kg	20	28	25	25	25	23	22	24	23	20
SW6010	7439-89-6	**Iron**	5500	19000	**27000**	29951	mg/kg	19000 J	33000 J	27000 J	24000 J	25000 J	22000 J	19000 J	23000 J	20000 J	18000 J
SW6010	7439-92-1	Lead	**400**	33	67	95.18	mg/kg	12	14	12 J	11 J	14 J	10 J	9.7 J	11 J	11 J	8.7 J
SW6010	7439-95-4	Magnesium	**NV**	1400	2000	2238	mg/kg	3700	8000	11000 J	10000 J	2600 J	9400 J	8600 J	9400 J	11000	8200 J
SW6010	7439-96-5	**Manganese**	180	240	**440**	537.2	mg/kg	380 J	500 J	450 J	450 J	430 J	430 J	390 J	460 J	430 J	390 J
SW6010	7439-98-7	Molybdenum	**39**	3.3	5.7	6.398	mg/kg	2.8	9	2.1	1.8	3.2	2.3	1.9	2.2	2.3	2.3
SW6010	7440-02-0	Nickel	**160**	16	21	22.69	mg/kg	17 J	24 J	26	18	21	20	17	21	19 J	15
SW6010	7440-09-7	Potassium	**NV**	550	770	830.7	mg/kg	900 J	1500 J	2400 J	1200 J	1100 J	1600 J	1300 J	1700 J	1300 J	880 J
SW6010	7782-49-2	Selenium	**39**	1	1.4	1.676	mg/kg	0.74 J	1.1 J	-	-	-	-	-	-	0.7 J	-
SW6010	7440-28-0	**Thallium**	**0.51**	0.42	0.42	0.42	mg/kg	-	0.59 J	-	-	-	-	-	-	-	-
SW6010	7440-62-2	Vanadium	**55**	20	25	25.97	mg/kg	14 J	18 J	19	12	18	14	12	16	14 J	10
SW6010	7440-66-6	Zinc	**2300**	60	95	111.8	mg/kg	51	84	59 J	59 J	64 J	56 J	52 J	55 J	53 J	51 J
SW7471	7439-97-6	Mercury	**0.67**	0.036	0.068	0.0908	mg/kg	-	0.0094 J	0.016 J	0.011 J	0.023 J	0.0088 J	0.013 J	0.015 J	-	-
SW8260	67-64-1	Acetone	**6100**				mg/kg	0.015 J	0.0065 J	0.0076 J	0.034	0.014	-	0.0093	0.012	0.006 J	0.027 J
SW8260	91-20-3	Naphthalene	**3.9**	0.0082	0.011	0.01363	mg/kg	-	-	-	-	-	-	-	-	0.0028 J	-
SW8270	121-14-2	2,4-Dinitrotoluene	**12**	0.048	0.27	0.2233	mg/kg	-	-	-	-	-	-	-	-	0.4 J	-
SW8270	606-20-2	2,6-Dinitrotoluene	**6.1**	0.14	0.14	0.14	mg/kg	-	-	-	-	-	-	-	-	0.23 J	-
SW8270	91-57-6	2-Methylnaphthalene	**31**				mg/kg	-	-	-	-	-	-	0.09 J	0.31	-	-
SW8270	83-32-9	Acenaphthene	**340**				mg/kg	-	-	-	-	0.034 J	-	2	1.3	-	-
SW8270	208-96-8	Acenaphthylene	**340**				mg/kg	-	0.013 J	-	-	0.035 J	-	0.013 J	0.036 J	-	-
SW8270	120-12-7	Anthracene	**1700**	0.0077	0.01	0.01099	mg/kg	0.012 J	0.062	0.014 J	0.0093 J	0.14	0.019 J	0.92	3	-	-
SW8270	56-55-3	**Benzo(a)anthracene**	**0.15**	0.024	0.052	0.07301	mg/kg	0.07	0.22	0.028 J	0.03 J	0.33	0.034 J	1.2	7.2	-	-
SW8270	50-32-8	**Benzo(a)pyrene**	0.015	0.025	**0.059**	0.08732	mg/kg	0.032 J	0.12	0.022 J	0.02 J	0.21	0.02 J	0.95	6.2	-	-
SW8270	205-99-2	**Benzo(b)fluoranthene**	**0.15**	0.04	0.097	0.1357	mg/kg	0.055	0.22	0.028 J	0.033 J	0.35	0.035 J	1.2	7.6	-	-
SW8270	191-24-2	Benzo(g,h,i)perylene	**170**	0.021	0.046	0.06756	mg/kg	0.021 J	0.093	0.025 J	0.022 J	0.13	0.021 J	0.54	2.1	0.013 J	0.015 J
SW8270	207-08-9	**Benzo(k)fluoranthene**	**1.5**	0.013	0.04	0.05595	mg/kg	0.026 J	0.091	0.021 J	0.0099 J	0.15	0.017 J	0.6	2.1	-	-
SW8270	86-74-8	Carbazole	**NV**				mg/kg	-	0.065 J	-	-	0.13 J	-	1.3	1.2	-	-
SW8270	218-01-9	Chrysene	**15**	0.029	0.073	0.1052	mg/kg	0.073	0.22	0.046	0.042 J	0.36	0.047	1.2	7.3	0.019 J	0.02 J
SW8270	53-70-3	**Dibenz(a,h)anthracene**	**0.015**	0.011	0.012	0.01228	mg/kg	-	0.026 J	-	-	0.042	-	0.15	0.58	-	-

Table 3-6 – continued
Nike Site CL-48 Site Inspection
Former Missile Magazine Area (LA2)
Detected Constituents – Soil

							Sample Location:	SB02-LA2	SB02-LA2	SB03-LA2	SB03-LA2	SB04-LA2	SB04-LA2	SB05-LA2	SB05-LA2	SB13-LA2	SB14-LA2
							Sample ID:	SB02S019LA2	SB02S025LA2	SB03S019LA2	SB03S025LA2	SB04S021LA2	SB04S025LA2	SB05S023LA2	SB05S025LA2	SB13S024LA2	SB14S024LA2
							Sample Date:	11/14/2008	11/14/2008	11/13/2008	11/13/2008	11/13/2008	11/13/2008	11/10/2008	11/10/2008	11/17/2008	11/18/2008
							Sample Type:	N	N	N	N	N	N	N	N	N	N
							Matrix:	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
							Depth (feet):	17-19	23-25	17-19	23-25	19-21	23-25	21-23	23-25	22-24	22-24
Method	**CAS No.**	**Analyte**	**EPARSL RS**	**BKGRND MIN**	**BKGRND MAX**	**BKGRND CALC**	**Units**										
SW8270	132-64-9	Dibenzofuran	**NV**				mg/kg	-	-	-	-	0.089 J	-	1.5	1.5	-	-
SW8270	206-44-0	Fluoranthene	**230**	0.056	0.14	0.2077	mg/kg	0.27	0.67	0.069	0.072	0.99	0.11	2.8	19	-	-
SW8270	86-73-7	Fluorene	**230**				mg/kg	-	-	-	-	0.03 J	-	2	2.5	-	-
SW8270	193-39-5	**Indeno(1,2,3-cd)pyrene**	**0.15**	0.018	0.042	0.06105	mg/kg	0.018 J	0.082	0.012 J	0.013 J	0.12	0.013 J	0.47	2.1	-	-
SW8270	91-20-3	Naphthalene	**3.9**	0.0082	0.011	0.01363	mg/kg	-	0.019 J	-	-	0.028 J	-	0.2	0.25	-	-
SW8270	85-01-8	Phenanthrene	**170**	0.03	0.073	0.09326	mg/kg	0.11	0.67	0.082	0.059	1	0.13	2.5	16	0.012 J	0.015 J
SW8270	129-00-0	Pyrene	**170**	0.046	0.11	0.1434	mg/kg	0.24	0.46	0.06	0.067	0.68	0.074	2	15	-	0.014 J
SW9045	PH	pH					su	8.06 J	8.23 J	7.96 J	8.11 J	8.91 J	8.52 J	8.39 J	8.48 J	8.3 J	8.36 J

Notes:

SO	= soil sample
FD	= field duplicate sample
N	= normal (primary) sample
EPARSL RS	= USEPA Regional Screening Level for Residential Soil, September 12, 2008
BKGRND MIN	= Background Minimum Value
BKGRND MAX	= Background Maximum Value
BKGRND CALC	= Background Calculated Value as calculated in Appendix I
mg/kg	= milligrams per kilogram
NV	= No Value
su	= standard units (pH)
J	= estimated value
NA	= sample was not analyzed for the analyte indicated
	See Table 2-1 for list of required analytes for this AOC

Dash (-) indicates analyte undetected in that sample
Analytes not listed were undetected in all samples
Samples not listed were undetected for all analytes

Bold indicates the screening value used for comparison to results (EPARSL RS **or** Maximum Background)

= Result is above screening value for analyte

Analyte = Constituent of Potential Concern for AOC

Table 3-7
Nike Site CL-48 Site Inspection
Former Acid Fueling Area (LA3)
Detected Constituents - Soil

						Sample Location:	SB06-LA3	SB06-LA3	SB06-LA3	SB23-LA3	SB23-LA3	SB23-LA3	SB24-LA3	SB24-LA3
						Sample ID:	SB06S001LA3	SB06S008LA3	SB06S014LA3	SB23C008LA3	SB23S001LA3	SB23S008LA3	SB24S001LA3	SB24S008LA3
						Sample Date:	11/20/2008	11/20/2008	11/20/2008	11/20/2008	11/20/2008	11/20/2008	11/20/2008	11/20/2008
						Sample Type:	N	N	N	FD	N	N	N	N
						Matrix:	SO	SO	SO	SO	SO	SO	SO	SO
						Depth (feet):	0-1	6-8	12-14	6-8	0-1	6-8	0-1	6-8
Method	**CAS No.**	**Analyte**	**EPARSL RS**	**BKGRND MIN**	**BKGRND MAX**	**BKGRND CALC**	**Units**							
SW6010	7429-90-5	**Aluminum**	7700	8500	**10000**	10762	mg/kg	5800 J	12000 J	10000 J	10000 J	5000 J	12000 J	3300 J	9200 J
SW6010	7440-38-2	Arsenic	0.39	12	**26**	29.05	mg/kg	6.7	12	8.1	12	5.9	12	4	9.5
SW6010	7440-39-3	Barium	**1500**	36	67	81.03	mg/kg	37	54	38	51	29	60	24	42
SW6010	7440-41-7	Beryllium	**16**	0.52	0.67	0.769	mg/kg	0.58	0.64	0.54	0.53	0.36	0.64 J	0.2 J	0.47
SW6010	7440-43-9	Cadmium	**7**	0.042	0.15	0.243	mg/kg	1.8	0.046 J	-	-	0.71	-	0.45	-
SW6010	7440-70-2	Calcium	**NV**	370	1100	1559	mg/kg	69000 J	3800 J	14000 J	1200 J	53000 J	1500 J	190000 J	820 J
SW6010	7440-47-3	Chromium	**280**	11	15	16.54	mg/kg	26	19	16	15	11	18	10	12
SW6010	7440-48-4	**Cobalt**	2.3	6.1	**7.7**	8.319	mg/kg	3.4	13	9.3	9.1	3.7	12 J	2.2	7.5
SW6010	7440-50-8	Copper	**310**	19	28	31.6	mg/kg	31	28	24	26	17	25	10	22
SW6010	7439-89-6	**Iron**	5500	19000	**27000**	29951	mg/kg	15000 J	31000 J	25000 J	24000 J	14000 J	28000 J	8700 J	21000 J
SW6010	7439-92-1	Lead	**400**	33	67	95.18	mg/kg	120 J	14 J	12 J	11 J	38 J	13 J	35 J	8.9 J
SW6010	7439-95-4	Magnesium	**NV**	1400	2000	2238	mg/kg	19000 J	5300 J	7000 J	3000 J	32000 J	3800 J	61000 J	2400 J
SW6010	7439-96-5	**Manganese**	180	240	**440**	537.2	mg/kg	550 J	490 J	280 J	340 J	260 J	450 J	200 J	310 J
SW6010	7440-02-0	Nickel	**160**	16	21	22.69	mg/kg	13	35	27	24	12	29	7.3	21
SW6010	7440-09-7	Potassium	**NV**	550	770	830.7	mg/kg	710 J	2000 J	1800 J	1400 J	810 J	1800 J	650 J	1400 J
SW6010	7782-49-2	Selenium	**39**	1	1.4	1.676	mg/kg	-	0.86 J	-	-	-	-	-	-
SW6010	7440-22-4	Silver	**39**				mg/kg	0.17 J	-	-	-	-	-	-	-
SW6010	7440-62-2	Vanadium	**55**	20	25	25.97	mg/kg	13	22	19	19	9.6	23	6.6	17
SW6010	7440-66-6	Zinc	**2300**	60	95	111.8	mg/kg	140 J	75 J	61 J	63 J	66 J	72 J	94 J	58 J
SW7471	7439-97-6	Mercury	**0.67**	0.036	0.068	0.0908	mg/kg	0.071	-	-	-	-	-	-	-
SW8260	67-64-1	Acetone	**6100**				mg/kg	-	-	0.02 J	0.024 J	0.011 J	0.014 J	0.0065 J	0.02 J
SW8270	91-57-6	2-Methylnaphthalene	**31**				mg/kg	0.33	-	-	-	0.094 J	-	0.021 J	-
SW8270	83-32-9	Acenaphthene	**340**				mg/kg	4.2	0.013 J	-	-	0.98	-	0.23	-
SW8270	208-96-8	Acenaphthylene	**340**				mg/kg	0.11	-	-	-	-	-	-	-
SW8270	120-12-7	Anthracene	**1700**	0.0077	0.01	0.01099	mg/kg	6.8 J	0.024 J	-	-	1.4 J	-	0.44 J	-
SW8270	56-55-3	**Benzo(a)anthracene**	**0.15**	0.024	0.052	0.07301	mg/kg	23	0.11	-	-	5.8	-	1.6	-
SW8270	50-32-8	**Benzo(a)pyrene**	0.015	0.025	**0.059**	0.08732	mg/kg	18	0.1	0.0079 J	-	4.5	-	1.3	-
SW8270	205-99-2	**Benzo(b)fluoranthene**	**0.15**	0.04	0.097	0.1357	mg/kg	23	0.14	0.013 J	-	6.5	-	1.7	-
SW8270	191-24-2	Benzo(g,h,i)perylene	**170**	0.021	0.046	0.06756	mg/kg	13	0.083	0.016 J	-	3.2	-	1.1	-
SW8270	207-08-9	**Benzo(k)fluoranthene**	**1.5**	0.013	0.04	0.05595	mg/kg	12 J	0.073 J	-	-	2.5 J	-	0.88 J	-
SW8270	117-81-7	bis(2-Ethylhexyl)phthalate	**35**				mg/kg	0.88 J	-	-	-	-	-	-	-
SW8270	86-74-8	Carbazole	**NV**				mg/kg	5.8	-	-	-	1.3	-	0.36	-
SW8270	218-01-9	**Chrysene**	**15**	0.029	0.073	0.1052	mg/kg	23	0.14	0.034 J	-	6	-	1.4	-
SW8270	53-70-3	**Dibenz(a,h)anthracene**	**0.015**	0.011	0.012	0.01228	mg/kg	3.7	0.023 J	-	-	0.2	-	0.13	-
SW8270	132-64-9	Dibenzofuran	**NV**				mg/kg	1.5 J	-	-	-	0.51 J	-	0.099 J	-
SW8270	206-44-0	Fluoranthene	**230**	0.056	0.14	0.2077	mg/kg	47 J	0.28 J	0.022 J	-	12 J	-	3.6 J	-
SW8270	86-73-7	Fluorene	**230**				mg/kg	4.5	-	-	-	1.2	-	0.25	-
SW8270	193-39-5	**Indeno(1,2,3-cd)pyrene**	**0.15**	0.018	0.042	0.06105	mg/kg	12 J	0.072 J	-	-	3 J	-	0.86 J	-

Table 3-7 – continued
Nike Site CL-48 Site Inspection
Former Acid Fueling Area (LA3)
Detected Constituents - Soil

						Sample Location:	SB06-LA3	SB06-LA3	SB06-LA3	SB23-LA3	SB23-LA3	SB23-LA3	SB24-LA3	SB24-LA3
						Sample ID:	SB06S001LA3	SB06S008LA3	SB06S014LA3	SB23C008LA3	SB23S001LA3	SB23S008LA3	SB24S001LA3	SB24S008LA3
						Sample Date:	11/20/2008	11/20/2008	11/20/2008	11/20/2008	11/20/2008	11/20/2008	11/20/2008	11/20/2008
						Sample Type:	N	N	N	FD	N	N	N	N
						Matrix:	SO	SO	SO	SO	SO	SO	SO	SO
						Depth (feet):	0-1	6-8	12-14	6-8	0-1	6-8	0-1	6-8
Method	**CAS No.**	**Analyte**	**EPARSL RS**	**BKGRND MIN**	**BKGRND MAX**	**BKGRND CALC**	**Units**								
SW8270	91-20-3	Naphthalene	**3.9**	0.0082	0.011	0.01363	mg/kg	0.46	-	-	-	0.15	-	-	-
SW8270	85-01-8	Phenanthrene	**170**	0.03	0.073	0.09326	mg/kg	33	0.17	0.022 J	-	10	-	2	-
SW8270	108-95-2	Phenol	**1800**				mg/kg	-	-	-	-	-	-	0.077 J	-
SW8270	129-00-0	Pyrene	**170**	0.046	0.11	0.1434	mg/kg	35 J	0.21 J	0.024 J	-	11 J	-	2.4 J	-
SW9045	PH	pH					su	7.71 J	7.62 J	8.81 J	7.26 J	7.68 J	7.03 J	7.56 J	8.21 J

Notes:

SO	= soil sample
FD	= field duplicate sample
N	= normal (primary) sample
EPARSL RS	= USEPA Regional Screening Level for Residential Soil, September 12, 2008
BKGRND MIN	= Background Minimum Value
BKGRND MAX	= Background Maximum Value
BKGRND CALC	= Background Calculated Value as calculated in Appendix I
mg/kg	= milligrams per kilogram
NV	= No Value
su	= standard units (pH)
J	= estimated value
NA	= sample was not analyzed for the analyte indicated
	See Table 2-1 for list of required analytes for this AOC

Dash (-) indicates analyte undetected in that sample
Analytes not listed were undetected in all samples
Samples not listed were undetected for all analytes

Bold indicates the screening value used for comparison to results (EPARSL RS **or** Maximum Background)

= Result is above screening value for analyte

Analyte = Constituent of Potential Concern for AOC

Table 3-8
Nike Site CL-48 Site Inspection
Former Septic System/Leach Field (LA4)
Detected Constituents – Soil

							Sample Location:	SB07-LA4	SB07-LA4	SB07-LA4	SB07-LA4	SB19-LA4	SB19-LA4	SB20-LA4	SB20-LA4	SB21-LA4	SB22-LA4
							Sample ID:	SB07C008LA4	SB07S006LA4	SB07S008LA4	SB07S012LA4	SB19C004LA4	SB19S004LA4	SB20C004LA4	SB20S004LA4	SB21S004LA4	SB22S004LA4
							Sample Date:	11/12/2008	11/12/2008	11/12/2008	11/12/2008	11/19/2008	11/19/2008	11/19/2008	11/19/2008	11/19/2008	11/19/2008
							Sample Type:	FD	N	N	N	FD	N	FD	N	N	N
							Matrix:	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
							Depth (feet):	6-8	4-6	6-8	10-12	3-4	3-4	3-4	3-4	3-4	3-4
Method	**CAS No.**	**Analyte**	**EPARSL RS**	**BKGRND MIN**	**BKGRND MAX**	**BKGRND CALC**	**Units**										
SW6010	7429-90-5	Aluminum	7700	8500	**10000**	10762	mg/kg	6200 J	8700 J	7500 J	9900 J	6800 J	7500 J	NA	8600 J	5000 J	7700 J
SW6010	7440-36-0	Antimony	**3.1**	0.38	0.77	1.01	mg/kg	-	-	0.62 J	0.4 J	0.35 J	-	NA	-	-	0.42 J
SW6010	7440-38-2	Arsenic	0.39	12	**26**	29.05	mg/kg	16	15	16	11	9.5	10	NA	13	8.7	12
SW6010	7440-39-3	Barium	**1500**	36	67	81.03	mg/kg	30	50	41	42	33	33	NA	40	23	48
SW6010	7440-41-7	Beryllium	**16**	0.52	0.67	0.769	mg/kg	0.32 J	0.42 J	0.36 J	0.5	0.38 J	0.38	NA	0.48	0.25 J	0.43
SW6010	7440-43-9	Cadmium	**7**	0.042	0.15	0.243	mg/kg	-	-	-	-	0.19 J	0.28	NA	0.083 J	0.45	0.077 J
SW6010	7440-70-2	Calcium	**NV**	370	1100	1559	mg/kg	3000 J	3300 J	2500 J	33000 J	5700 J	7400 J	NA	4400 J	47000 J	12000 J
SW6010	7440-47-3	Chromium	**280**	11	15	16.54	mg/kg	10	12	12	15	16	17	NA	13	7.7	12
SW6010	7440-48-4	**Cobalt**	2.3	6.1	**7.7**	8.19	mg/kg	8.5	10 J	9.5	10	6.1	6.1	NA	8.6	4.7	8.3
SW6010	7440-50-8	Copper	**310**	19	28	31.6	mg/kg	20	25	23	27	19	22	NA	32	21	30
SW6010	7439-89-6	**Iron**	5500	19000	**27000**	29951	mg/kg	22000 J	25000 J	25000 J	29000 J	20000 J	22000 J	NA	27000 J	15000 J	23000 J
SW6010	7439-92-1	Lead	**400**	33	67	95.18	mg/kg	11 J	16 J	14 J	13 J	14 J	14 J	NA	18 J	8.7 J	15 J
SW6010	7439-95-4	Magnesium	**NV**	1400	2000	2238	mg/kg	2600 J	3000 J	2900 J	11000 J	3500 J	4800 J	NA	3200 J	2700 J	5000 J
SW6010	7439-96-5	**Manganese**	180	240	**440**	537.2	mg/kg	290 J	440 J	360 J	500 J	250 J	290 J	NA	400 J	840 J	390 J
SW6010	7439-98-7	Molybdenum	**39**	3.3	5.7	6.398	mg/kg	1.8	2.7	2	2	4.1	3.8	NA	4.1	2	3.3
SW6010	7440-02-0	Nickel	**160**	16	21	22.69	mg/kg	21	22 J	23	26	19	21	NA	21	14	21
SW6010	7440-09-7	Potassium	**NV**	550	770	830.7	mg/kg	930 J	1000 J	1200 J	2200 J	1100 J	1000 J	NA	1100 J	740 J	1100 J
SW6010	7440-22-4	Silver	**39**				mg/kg	-	-	-	-	0.11 J	-	NA	-	-	-
SW6010	7440-62-2	Vanadium	**55**	20	25	25.97	mg/kg	13	16	15	19	19	18	NA	21	11	16
SW6010	7440-66-6	Zinc	**2300**	60	95	111.8	mg/kg	55 J	67 J	56 J	63 J	65 J	76 J	NA	64 J	55 J	61 J
SW7471	7439-97-6	Mercury	**0.67**	0.036	0.068	0.0908	mg/kg	0.012 J	0.03	0.016 J	0.011 J	-	-	NA	0.042	-	-
SW8260	67-64-1	Acetone	**6100**				mg/kg	-	-	-	0.0058 J	NA	-	NA	-	-	-
SW8260	91-20-3	Naphthalene	**3.9**	0.0082	0.011	0.01363	mg/kg	-	-	-	-	NA	0.0033 J	NA	-	-	-
SW8260	127-18-4	Tetrachloroethene	**0.57**				mg/kg	-	-	-	-	NA	-	NA	0.0031 J	-	-
SW8270	208-96-8	Acenaphthylene	**340**				mg/kg	-	0.0077 J	0.011 J	-	-	-	NA	-	-	-
SW8270	120-12-7	Anthracene	**1700**	0.0077	0.01	0.01099	mg/kg	0.0084 J	0.032 J	0.03 J	-	-	-	NA	-	0.0079 J	-
SW8270	56-55-3	Benzo(a)anthracene	**0.15**	0.024	0.052	0.07301	mg/kg	0.0067 J	0.026 J	0.043	-	0.016 J	0.018 J	NA	0.018 J	0.057	-
SW8270	50-32-8	**Benzo(a)pyrene**	0.015	0.025	**0.059**	0.08732	mg/kg	-	0.025 J	0.037 J	-	0.022 J	0.021 J	NA	0.023 J	0.067	-
SW8270	205-99-2	Benzo(b)fluoranthene	**0.15**	0.04	0.097	0.1357	mg/kg	-	0.03 J	0.048	-	0.035	0.037	NA	0.037 J	0.1	0.012 J
SW8270	191-24-2	Benzo(g,h,i)perylene	**170**	0.021	0.046	0.06756	mg/kg	0.0098 J	0.029 J	0.025 J	0.012 J	-	0.026 J	NA	0.025 J	0.071	0.014 J
SW8270	207-08-9	Benzo(k)fluoranthene	**1.5**	0.013	0.04	0.05595	mg/kg	-	0.015 J	0.017 J	-	0.014 J	0.015 J	NA	0.015 J	0.048 J	-
SW8270	117-81-7	bis(2-Ethylhexyl)phthalate	**35**				mg/kg	-	0.25	0.06 J	-	-	-	NA	-	-	-
SW8270	218-01-9	Chrysene	**15**	0.029	0.073	0.1052	mg/kg	0.013 J	0.032 J	0.047	0.019 J	0.035 J	0.04	NA	0.034 J	0.091	0.02 J
SW8270	53-70-3	Dibenz(a,h)anthracene	**0.015**	0.011	0.012	0.01228	mg/kg	-	-	-	-	-	-	NA	-	0.015 J	-
SW8270	206-44-0	Fluoranthene	**230**	0.056	0.14	0.2077	mg/kg	0.01 J	0.065	0.13	0.0089 J	0.048 J	0.047 J	NA	0.05 J	0.14 J	0.021 J
SW8270	86-73-7	Fluorene	**230**				mg/kg	-	0.013 J	0.017 J	-	-	-	NA	-	-	-
SW8270	193-39-5	Indeno(1,2,3-cd)pyrene	**0.15**	0.018	0.042	0.06105	mg/kg	-	0.023 J	0.022 J	-	0.018 J	0.017 J	NA	0.019 J	0.052 J	-
SW8270	91-20-3	Naphthalene	**3.9**	0.0082	0.011	0.01363	mg/kg	-	0.0087 J	0.017 J	-	-	-	NA	-	-	-

Table 3-8 – continued
Nike Site CL-48 Site Inspection
Former Septic System/Leach Field (LA4)
Detected Constituents – Soil

							Sample Location:	SB07-LA4	SB07-LA4	SB07-LA4	SB07-LA4	SB19-LA4	SB19-LA4	SB20-LA4	SB20-LA4	SB21-LA4	SB22-LA4
							Sample ID:	SB07C008LA4	SB07S006LA4	SB07S008LA4	SB07S012LA4	SB19C004LA4	SB19S004LA4	SB20C004LA4	SB20S004LA4	SB21S004LA4	SB22S004LA4
							Sample Date:	11/12/2008	11/12/2008	11/12/2008	11/12/2008	11/19/2008	11/19/2008	11/19/2008	11/19/2008	11/19/2008	11/19/2008
							Sample Type:	FD	N	N	N	FD	N	FD	N	N	N
							Matrix:	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
							Depth (feet):	6-8	4-6	6-8	10-12	3-4	3-4	3-4	3-4	3-4	3-4
Method	**CAS No.**	**Analyte**	**EPARSL RS**	**BKGRND MIN**	**BKGRND MAX**	**BKGRND CALC**	**Units**										
SW8270	85-01-8	Phenanthrene	**170**	0.03	0.073	0.09326	mg/kg	0.0087 J	0.067	0.12	0.018 J	0.04	0.051	NA	0.027 J	0.067	0.025 J
SW8270	129-00-0	Pyrene	**170**	0.046	0.11	0.1434	mg/kg	-	0.055	0.088	0.014 J	0.036 J	0.039 J	NA	0.039 J	0.11 J	0.019 J
SW9045	PH	pH					su	8.39 J	8.24 J	8.33 J	8.26 J	8.18 J	8.05 J	NA	7.68 J	8.51 J	8.66 J

Notes:

SO	= soil sample
FD	= field duplicate sample
N	= normal (primary) sample
EPARSL RS	= USEPA Regional Screening Level for Residential Soil, September 12, 2008
BKGRND MIN	= Background Minimum Value
BKGRND MAX	= Background Maximum Value
BKGRND CALC	= Background Calculated Value as calculated in Appendix I
mg/kg	= milligrams per kilogram
NV	= No Value
su	= standard units (pH)
J	= estimated value
NA	= sample was not analyzed for the analyte indicated
	See Table 2-1 for list of required analytes for this AOC

Dash (-) indicates analyte undetected in that sample
Analytes not listed were undetected in all samples
Samples not listed were undetected for all analytes

Bold indicates the screening value used for comparison to results (EPARSL RS **or** Maximum Background)

= Result is above screening value for analyte

Analyte = Constituent of Potential Concern for AOC

Table 3-9
Nike Site CL-48 Site Inspection
Suspected Solid Waste Disposal Area on the Adjacent Hillside (LA5)
Detected Constituents – Soil

							Sample Location:	MI01-LA5	MI01-LA5	MI02-LA5	MI02-LA5	SB27-LA5	SB27-LA5	SB28-LA5	SB28-LA5
							Sample ID:	MI01S001LA5	MI01S002LA5	MI02S001LA5	MI02S002LA5	SB27S001LA5	SB27S002LA5	SB28S001LA5	SB28S002LA5
							Sample Date:	11/22/2008	11/22/2008	11/22/2008	11/22/2008	11/22/2008	11/22/2008	11/22/2008	11/22/2008
							Sample Type:	N	N	N	N	N	N	N	N
							Matrix:	SO	SO	SO	SO	SO	SO	SO	SO
							Depth (feet):	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2
Method	**CAS No.**	**Analyte**	**EPARSL RS**	**BKGRND MIN**	**BKGRND MAX**	**BKGRND CALC**	**Units**								
SW6010	7429-90-5	Aluminum	7700	8500	**10000**	10762	mg/kg	7100 J	7100 J	6900 J	8000 J	NA	NA	NA	NA
SW6010	7440-36-0	Antimony	**3.1**	0.38	0.77	1.01	mg/kg	0.57 J	0.43 J	0.49 J	0.31 J	NA	NA	NA	NA
SW6010	7440-38-2	Arsenic	0.39	12	**26**	29.05	mg/kg	13 J	14 J	12 J	12 J	NA	NA	NA	NA
SW6010	7440-39-3	Barium	**1500**	36	67	81.03	mg/kg	38	40	37	44	NA	NA	NA	NA
SW6010	7440-41-7	Beryllium	**16**	0.52	0.67	0.769	mg/kg	0.43	0.45	0.43	0.46	NA	NA	NA	NA
SW6010	7440-43-9	Cadmium	**7**	0.042	0.15	0.243	mg/kg	0.25	0.095 J	0.18 J	0.15 J	NA	NA	NA	NA
SW6010	7440-70-2	Calcium	**NV**	370	1100	1559	mg/kg	2600 J	3900 J	2500 J	5800 J	NA	NA	NA	NA
SW6010	7440-47-3	Chromium	**280**	11	15	16.54	mg/kg	79	95	73	71	NA	NA	NA	NA
SW6010	7440-48-4	**Cobalt**	2.3	6.1	**7.7**	8.319	mg/kg	9.3	9.3	8.7	9.3	NA	NA	NA	NA
SW6010	7440-50-8	Copper	**310**	19	28	31.6	mg/kg	28	27	26	25	NA	NA	NA	NA
SW6010	7439-89-6	Iron	5500	19000	**27000**	29951	mg/kg	24000 J	25000 J	26000 J	24000 J	NA	NA	NA	NA
SW6010	7439-92-1	Lead	**400**	33	67	95.18	mg/kg	21	17	19	17	NA	NA	NA	NA
SW6010	7439-95-4	Magnesium	**NV**	1400	2000	2238	mg/kg	2400	2900	2300	3600	NA	NA	NA	NA
SW6010	7439-96-5	**Manganese**	180	240	**440**	537.2	mg/kg	440 J	440 J	420 J	470 J	NA	NA	NA	NA
SW6010	7439-98-7	Molybdenum	**39**	3.3	5.7	6.398	mg/kg	4.1	4.7	3.8	3.4	NA	NA	NA	NA
SW6010	7440-02-0	Nickel	**160**	16	21	22.69	mg/kg	50	54	46	49	NA	NA	NA	NA
SW6010	7440-09-7	Potassium	**NV**	550	770	830.7	mg/kg	1200 J	940 J	1200 J	1200 J	NA	NA	NA	NA
SW6010	7440-62-2	Vanadium	**55**	20	25	25.97	mg/kg	17	17	17	18	NA	NA	NA	NA
SW6010	7440-66-6	Zinc	**2300**	60	95	111.8	mg/kg	150 J	79 J	120 J	290 J	NA	NA	NA	NA
SW7471	7439-97-6	Mercury	**0.67**	0.036	0.068	0.0908	mg/kg	0.029	0.022	0.034	0.027	NA	NA	NA	NA
SW8270	91-57-6	2-Methylnaphthalene	**31**				mg/kg	0.02 J	-	0.033 J	-	NA	NA	NA	NA
SW8270	83-32-9	Acenaphthene	**340**				mg/kg	-	-	0.025 J	-	NA	NA	NA	NA
SW8270	120-12-7	Anthracene	**1700**	0.0077	0.01	0.01099	mg/kg	0.0076 J	-	0.055 J	-	NA	NA	NA	NA
SW8270	56-55-3	Benzo(a)anthracene	**0.15**	0.024	0.052	0.07301	mg/kg	0.028 J	0.011 J	0.11	0.014 J	NA	NA	NA	NA
SW8270	50-32-8	**Benzo(a)pyrene**	0.015	0.025	**0.059**	0.08732	mg/kg	0.028 J	0.013 J	0.098	0.017 J	NA	NA	NA	NA
SW8270	205-99-2	Benzo(b)fluoranthene	**0.15**	0.04	0.097	0.1357	mg/kg	0.039	0.019 J	0.13	0.025 J	NA	NA	NA	NA
SW8270	191-24-2	Benzo(g,h,i)perylene	**170**	0.021	0.046	0.06756	mg/kg	0.025 J	0.015 J	0.069	0.018 J	NA	NA	NA	NA
SW8270	207-08-9	Benzo(k)fluoranthene	**1.5**	0.013	0.04	0.05595	mg/kg	0.023 J	0.012 J	0.061 J	0.011 J	NA	NA	NA	NA
SW8270	117-81-7	bis(2-Ethylhexyl)phthalate	**35**				mg/kg	0.18 J	-	-	-	NA	NA	NA	NA
SW8270	86-74-8	Carbazole	**NV**				mg/kg	-	-	0.036 J	-	NA	NA	NA	NA
SW8270	218-01-9	Chrysene	**15**	0.029	0.073	0.1052	mg/kg	0.04	0.022 J	0.11	0.026 J	NA	NA	NA	NA
SW8270	53-70-3	**Dibenz(a,h)anthracene**	**0.015**	0.011	0.012	0.01228	mg/kg	0.0089 J	-	0.016 J	-	NA	NA	NA	NA
SW8270	206-44-0	Fluoranthene	**230**	0.056	0.14	0.2077	mg/kg	0.064 J	0.028 J	0.29 J	0.037 J	NA	NA	NA	NA
SW8270	193-39-5	Indeno(1,2,3-cd)pyrene	**0.15**	0.018	0.042	0.06105	mg/kg	0.021 J	0.0095 J	0.058 J	0.013 J	NA	NA	NA	NA
SW8270	85-01-8	Phenanthrene	**170**	0.03	0.073	0.09326	mg/kg	0.045	0.023 J	0.24	0.03 J	NA	NA	NA	NA
SW8270	129-00-0	Pyrene	**170**	0.046	0.11	0.1434	mg/kg	0.053 J	0.021 J	0.22 J	0.03 J	NA	NA	NA	NA
SW9045	PH	pH					su	7.25 J	7.88 J	7.34 J	7.8 J	NA	NA	NA	NA

Table 3-9 – continued
Nike Site CL-48 Site Inspection
Suspected Solid Waste Disposal Area on the Adjacent Hillside (LA5)
Detected Constituents – Soil

Notes:

SO	= soil sample
FD	= field duplicate sample
N	= normal (primary) sample
EPARSL RS	= USEPA Regional Screening Level for Residential Soil, September 12, 2008
BKGRND MIN	= Background Minimum Value
BKGRND MAX	= Background Maximum Value
BKGRND CALC	= Background Calculated Value as calculated in Appendix I
mg/kg	= milligrams per kilogram
NV	= No Value
su	= standard units (pH)
J	= estimated value
NA	= sample was not analyzed for the analyte indicated
	See Table 2-1 for list of required analytes for this AOC

Dash (-) indicates analyte undetected in that sample
Analytes not listed were undetected in all samples
Samples not listed were undetected for all analytes

Bold indicates the screening value used for comparison to results (EPARSL RS **or** Maximum Background)

= Result is above screening value for analyte

Analyte = Constituent of Potential Concern for AOC

Table 3-10
Nike Site CL-48 Site Inspection
Former Transformer Pad (LA6)
Detected Constituents - Soil

								Sample Location:	SB15-LA6	SB15-LA6
								Sample ID:	SB15S002LA6	SB15S003LA6
								Sample Date:	11/17/2008	11/17/2008
								Sample Type:	N	N
								Matrix:	SO	SO
								Depth (feet):	1-2	2-3
Method	**CAS No.**	**Analyte**	**EPARSL RS**	**BKGRND MIN**	**BKGRND MAX**	**BKGRND CALC**	**Units**			
No analytes detected										

Notes:

SO	= soil sample
FD	= field duplicate sample
N	= normal (primary) sample
EPARSL RS	= USEPA Regional Screening Level for Residential Soil, September 12, 2008
BKGRND MIN	= Background Minimum Value
BKGRND MAX	= Background Maximum Value
BKGRND CALC	= Background Calculated Value as calculated in Appendix I
mg/kg	= milligrams per kilogram
NV	= No Value
su	= standard units (pH)
J	= estimated value
NA	= sample was not analyzed for the analyte indicated
	See Table 2-1 for list of required analytes for this AOC

Dash (-) indicates analyte undetected in that sample
Analytes not listed were undetected in all samples
Samples not listed were undetected for all analytes

Bold indicates the screening value used for comparison to results (EPARSL RS **or** Maximum Background)

= Result is above screening value for analyte

Analyte = Constituent of Potential Concern for AOC

Table 3-11
Nike Site CL-48 Site Inspection
Former Acid Storage Shed (LA7)
Detected Constituents – Soil

							Sample Location:	MI03-LA7	MI03-LA7
							Sample ID:	MI03S001LA7	MI03S003LA7
							Sample Date:	11/19/2008	11/19/2008
							Sample Type:	N	N
							Matrix:	SO	SO
							Depth (feet):	0-1	1-3
Method	**CAS No.**	**Analyte**	**EPARSL RS**	**BKGRND MIN**	**BKGRND MAX**	**BKGRND CALC**	**Units**		
SW6010	7429-90-5	Aluminum	7700	8500	**10000**	10762	mg/kg	9000	10000
SW6010	7440-38-2	Arsenic	0.39	12	**26**	29.05	mg/kg	15	15
SW6010	7440-39-3	Barium	**1500**	36	67	81.03	mg/kg	160	49
SW6010	7440-41-7	Beryllium	**16**	0.52	0.67	0.769	mg/kg	0.54	0.51
SW6010	7440-43-9	Cadmium	**7**	0.042	0.15	0.243	mg/kg	1.4	-
SW6010	7440-70-2	Calcium	**NV**	370	1100	1559	mg/kg	6300	1800
SW6010	7440-47-3	Chromium	**280**	11	15	16.54	mg/kg	100	32
SW6010	7440-48-4	**Cobalt**	2.3	6.1	**7.7**	8.319	mg/kg	8.3	9.1
SW6010	7440-50-8	Copper	**310**	19	28	31.6	mg/kg	85	28
SW6010	7439-89-6	Iron	5500	19000	**27000**	29951	mg/kg	25000	25000
SW6010	7439-92-1	Lead	**400**	33	67	95.18	mg/kg	90	29
SW6010	7439-95-4	Magnesium	**NV**	1400	2000	2238	mg/kg	2100	2100
SW6010	7439-96-5	**Manganese**	180	240	**440**	537.2	mg/kg	500	390
SW6010	7439-98-7	Molybdenum	**39**	3.3	5.7	6.398	mg/kg	4.6	4
SW6010	7440-02-0	Nickel	**160**	16	21	22.69	mg/kg	52	26
SW6010	7440-09-7	Potassium	**NV**	550	770	830.7	mg/kg	1100	1100
SW6010	7782-49-2	Selenium	**39**	1	1.4	1.676	mg/kg	0.55 J	0.57 J
SW6010	7440-22-4	Silver	**39**				mg/kg	2.2	-
SW6010	7440-62-2	Vanadium	**55**	20	25	25.97	mg/kg	21	24
SW6010	7440-66-6	Zinc	**2300**	60	95	111.8	mg/kg	780	78
SW7471	7439-97-6	Mercury	**0.67**	0.036	0.068	0.0908	mg/kg	0.19	0.037
SW9045	PH	pH					su	7.19 J	7.04 J

Table 3-11 – continued
Nike Site CL-48 Site Inspection
Former Acid Storage Shed (LA7)
Detected Constituents – Soil

Notes:

SO	= soil sample
FD	= field duplicate sample
N	= normal (primary) sample
EPARSL RS	= USEPA Regional Screening Level for Residential Soil, September 12, 2008
BKGRND MIN	= Background Minimum Value
BKGRND MAX	= Background Maximum Value
BKGRND CALC	= Background Calculated Value as calculated in Appendix I
mg/kg	= milligrams per kilogram
NV	= No Value
su	= standard units (pH)
J	= estimated value
NA	= sample was not analyzed for the analyte indicated
	See Table 2-1 for list of required analytes for this AOC

Dash (-) indicates analyte undetected in that sample

Analytes not listed were undetected in all samples

Samples not listed were undetected for all analytes

Bold indicates the screening value used for comparison to results (EPARSL RS **or** Maximum Background)

= Result is above screening value for analyte

Analyte = Constituent of Potential Concern for AOC

Table 3-12
Nike Site CL-48 Site Inspection
Background Area (LAB)
Detected Constituents – Soil

			Sample Location:		SB33-LAB	SB34-LAB	SB35-LAB	SB36-LAB	SB37-LAB	SB38-LAB	SB39-LAB	SB40-LAB			
			Sample ID:		SB33S001LAB	SB34S001LAB	SB35S001LAB	SB36S001LAB	SB37S001LAB	SB38S001LAB	SB39S001LAB	SB40S001LAB			
			Sample Date:		11/15/2008	11/15/2008	11/15/2008	11/15/2008	11/15/2008	11/15/2008	11/15/2008	11/15/2008			
			Sample Type:		N	N	N	N	N	N	N	N			
			Matrix:		SO	SO	SO	SO	SO	SO	SO	SO			
			Depth (feet):		0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1			
Method	**CAS No.**	**Analyte**	**EPARSL RS**	**Units**									**BKGRND MIN**	**BKGRND MAX**	**BKGRND CALC**
SW6010	7429-90-5	**Aluminum**	7700	mg/kg	9100 J	10000 J	9200 J	8600 J	8800 J	9900 J	8500 J	9300 J	8500	**10000**	10762
SW6010	7440-36-0	Antimony	**3.1**	mg/kg	0.59 J	0.66 J	0.59 J	0.77 J	0.38 J	0.66 J	0.5 J	0.41 J	0.38	0.77	1.01
SW6010	7440-38-2	**Arsenic**	0.39	mg/kg	12 J	13 J	15 J	17 J	14 J	26 J	12 J	16 J	12	**26**	29.05
SW6010	7440-39-3	Barium	**1500**	mg/kg	67 J	57 J	57 J	46 J	51 J	44 J	36 J	51 J	36	67	81.03
SW6010	7440-41-7	Beryllium	**16**	mg/kg	0.65	0.67	0.66	0.57	0.55	0.61	0.52	0.62	0.52	0.67	0.769
SW6010	7440-43-9	Cadmium	**7**	mg/kg	0.13 J	0.12 J	0.11 J	0.13 J	0.1 J	0.15 J	0.042 J	0.1 J	0.042	0.15	0.243
SW6010	7440-70-2	Calcium	**NV**	mg/kg	430 J	760 J	1100 J	710 J	890 J	800 J	370 J	610 J	370	1100	1559
SW6010	7440-47-3	Chromium	**280**	mg/kg	14 J	13 J	13 J	12 J	12 J	15 J	11 J	13 J	11	15	16.54
SW6010	7440-48-4	**Cobalt**	2.3	mg/kg	7 J	6.7 J	6.8 J	6.5 J	6.7 J	7.4 J	6.1 J	7.7 J	6.1	**7.7**	8.319
SW6010	7440-50-8	Copper	**310**	mg/kg	19	21	24	22	22	28	21	26	19	28	31.6
SW6010	7439-89-6	**Iron**	5500	mg/kg	19000 J	20000 J	20000 J	20000 J	19000 J	27000 J	20000 J	25000 J	19000	**27000**	29951
SW6010	7439-92-1	Lead	**400**	mg/kg	36	62	54	63	49	55	33	67	33	67	95.18
SW6010	7439-95-4	Magnesium	**NV**	mg/kg	1500	1500	1500	1400	1500	2000	1500	1900	1400	2000	2238
SW6010	7439-96-5	**Manganese**	180	mg/kg	380 J	390 J	330 J	290 J	300 J	300 J	240 J	440 J	240	**440**	537.2
SW6010	7439-98-7	Molybdenum	**39**	mg/kg	3.4	3.3	4	3.9	3.4	5.7	4.2	4.5	3.3	5.7	6.398
SW6010	7440-02-0	Nickel	**160**	mg/kg	16 J	17 J	18 J	16 J	16 J	21 J	16 J	19 J	16	21	22.69
SW6010	7440-09-7	Potassium	**NV**	mg/kg	560 J	660 J	570 J	590 J	550 J	770 J	550 J	640 J	550	770	830.7
SW6010	7782-49-2	Selenium	**39**	mg/kg	1 J	1.1 J	1.4 J	1.3 J	1.1 J	1.3 J	1.2 J	1.4	1	1.4	1.676
SW6010	7440-28-0	Thallium	**0.51**	mg/kg	-	-	-	-	-	-	-	0.42 J	0.42	0.42	0.42
SW6010	7440-62-2	Vanadium	**55**	mg/kg	20 J	21 J	21 J	20 J	20 J	25 J	20 J	22 J	20	25	25.97
SW6010	7440-66-6	Zinc	**2300**	mg/kg	72	83	95	80	78	88	60	79	60	95	111.8
SW7471	7439-97-6	Mercury	**0.67**	mg/kg	0.062	0.059	0.068	0.059	0.045	0.057	0.036	0.061	0.036	0.068	0.0908
SW8270	121-14-2	2,4-Dinitrotoluene	**12**	mg/kg	-	-	-	-	-	0.27	0.048 J	-	0.048	0.27	0.2233
SW8270	606-20-2	2,6-Dinitrotoluene	**6.1**	mg/kg	-	-	-	-	-	0.14 J	-	-	0.14	0.14	0.14
SW8270	120-12-7	Anthracene	**1700**	mg/kg	-	-	0.0094 J	0.0077 J	-	0.01 J	-	-	0.0077	0.01	0.01099
SW8270	56-55-3	Benzo(a)anthracene	**0.15**	mg/kg	0.025 J	0.032 J	0.049	0.046	0.024 J	0.052	0.028 J	0.032 J	0.024	0.052	0.07301
SW8270	50-32-8	**Benzo(a)pyrene**	0.015	mg/kg	0.027 J	0.037 J	0.059	0.052	0.025 J	0.059	0.034 J	0.037 J	0.025	**0.059**	0.08732
SW8270	205-99-2	Benzo(b)fluoranthene	**0.15**	mg/kg	0.044	0.064	0.097	0.084	0.04	0.085	0.057	0.06	0.04	0.097	0.1357
SW8270	191-24-2	Benzo(g,h,i)perylene	**170**	mg/kg	0.021 J	0.028 J	0.046	0.041	0.021 J	0.046	0.029 J	0.032 J	0.021	0.046	0.06756
SW8270	207-08-9	Benzo(k)fluoranthene	**1.5**	mg/kg	0.015 J	0.015 J	0.032 J	0.029 J	0.013 J	0.04	0.016 J	0.02 J	0.013	0.04	0.05595
SW8270	65-85-0	Benzoic acid	**24000**	mg/kg	2.4	-	-	2.1	1.7 J	4.4 J	0.73 J	0.42 J	0.42	4.4	6.585
SW8270	218-01-9	Chrysene	**15**	mg/kg	0.033 J	0.046	0.073	0.062	0.029 J	0.068	0.039 J	0.045	0.029	0.073	0.1052
SW8270	53-70-3	Dibenz(a,h)anthracene	**0.015**	mg/kg	-	-	0.011 J	0.011 J	-	0.012 J	-	-	0.011	0.012	0.01228
SW8270	206-44-0	Fluoranthene	**230**	mg/kg	0.057	0.077	0.14	0.11	0.056	0.14	0.066	0.08	0.056	0.14	0.2077
SW8270	193-39-5	Indeno(1,2,3-cd)pyrene	**0.15**	mg/kg	0.018 J	0.025 J	0.042	0.035 J	0.018 J	0.041	0.025 J	0.028 J	0.018	0.042	0.06105
SW8270	91-20-3	Naphthalene	**3.9**	mg/kg	0.01 J	0.0087 J	0.011 J	0.011 J	-	0.011 J	0.0082 J	0.011 J	0.0082	0.011	0.01363
SW8270	85-01-8	Phenanthrene	**170**	mg/kg	0.03 J	0.035 J	0.061	0.047	0.033 J	0.073	0.032 J	0.041	0.03	0.073	0.09326
SW8270	129-00-0	Pyrene	**170**	mg/kg	0.046	0.06	0.11	0.089	0.049	0.1	0.056	0.065	0.046	0.11	0.1434

Table 3-12 – continued
Nike Site CL-48 Site Inspection
Background Area (LAB)
Detected Constituents – Soil

Notes:

SO	= soil sample
FD	= field duplicate sample
N	= normal (primary) sample
EPARSL RS	= USEPA Regional Screening Level for Residential Soil, September 12, 2008
BKGRND MIN	= Background Minimum Value
BKGRND MAX	= Background Maximum Value
BKGRND CALC	= Background Calculated Value as calculated in Appendix I
mg/kg	= milligrams per kilogram
NV	= No Value
su	= standard units (pH)
J	= estimated value
NA	= sample was not analyzed for the analyte indicated
	See Table 2-1 for list of required analytes for this AOC

Dash (-) indicates analyte undetected in that sample
Analytes not listed were undetected in all samples
Samples not listed were undetected for all analytes

Analyte = Maximum Background Value is above EPARSL RS. Use Maximum Background Value for Screening

Bold indicates the screening value used for comparison to results in Tables 3-2 through 3-11

3.7 Groundwater Analytical Results Summary

Table 3-13 presents a summary of detected constituents in groundwater samples collected from the Launch Area. Detected analyte concentrations are shown in bold. For comparison purposes, the USEPA Regional Screening Levels for tap water (EPARSL WG), adjusted by a factor of 0.1 (for non-carcinogens) in accordance with USEPA screening guidance (USEPA, 2008), and the maximum contaminant level (MCL) are shown on the table. Analytes exceeding either or both screening levels are highlighted. No groundwater samples were planned or collected at the Control Area. Complete analytical results for all groundwater samples are included in Appendix D, and the DVR is provided in Appendix E. Discussion of the screening levels used for the groundwater data assessment is in Section 3.8.

Table 3-13
Nike Site CL-48 Site Inspection
Detected Constituents – Groundwater

					Sample Location:	MW01-LA1	MW02-LA2	MW03-LA2	MW04-LA2	MW05-LA2	MW06-LA3	MW06-LA3	MW07-LA4	MW07-LA4	MW10-LA0	MW11-LA0
					Sample ID:	MW01G001LA1	MW02G001LA2	MW03G001LA2	MW04G001LA2	MW05G001LA2	MW06G001LA3	MW06H001LA3	MW07G001LA4	MW07H001LA4	MW10G001LA0	MW11G001LA0
					Sample Date:	12/3/2008	12/3/2008	12/4/2008	12/4/2008	12/4/2008	12/3/2008	12/3/2008	12/3/2008	12/3/2008	12/4/2008	12/2/2008
					Sample Type:	N	N	N	N	N	N	FD	N	FD	N	N
					Matrix:	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
Method	**CAS No.**	**Analyte**	**EPARSL WG (a)**	**EPA MCL (b)**	**Units**											
SW6020	7429-90-5	**Aluminum (Dissolved)**	3700	**50**	ug/l	-	-	-	-	-	-	NA	-	-	**590 J b**	-
SW6020	7429-90-5	**Aluminum**	**3700**	**50**	ug/l	**29 J**	-	**200 J b**	**36000 J ab**	**770 J b**	-	NA	**30 J**	**63 J b**	**550 J b**	**420 b**
SW6020	7440-36-0	**Antimony (Dissolved)**	**1.5**	6	ug/l	**0.5 J**	-	-	**0.63 J**	**1.8 J a**	-	NA	**0.48 J**	**0.53 J**	**0.88 J**	-
SW6020	7440-36-0	Antimony	1.5	6	ug/l	**0.68 J**	**0.59 J**	-	**0.96 J**	-	-	NA	-	**1.3 J**	**1 J**	-
SW6020	7440-38-2	**Arsenic (Dissolved)**	**0.045**	10	ug/l	**0.66 J a**	**5.4 a**	**1.8 a**	**9.3 a**	**0.64 J a**	**0.51 J a**	NA	**0.44 J a**	**0.36 J a**	**1.2 a**	**1.2 a**
SW6020	7440-38-2	**Arsenic**	**0.045**	**10**	ug/l	**0.66 J a**	**5.1 a**	**2.4 a**	**62 J ab**	**1.5 a**	**0.44 J a**	NA	**0.41 J a**	**0.4 J a**	**1.6 a**	**2 a**
SW6020	7440-39-3	Barium (Dissolved)	730	2000	ug/l	**110**	**110**	**140**	**32**	**95**	**120**	NA	**98**	**100**	**87**	**51**
SW6020	7440-39-3	Barium	730	2000	ug/l	**100**	**120**	**140**	**270 J**	**120**	**120**	NA	**96**	**100**	**95**	**48**
SW6020	7440-41-7	Beryllium	7.3	4	ug/l	-	-	-	**2.1 J**	**0.23 J**	-	NA	-	-	-	-
SW6020	7440-43-9	Cadmium (Dissolved)	1.8	5	ug/l	-	-	-	-	-	-	NA	-	-	**0.17 J**	-
SW6020	7440-43-9	Cadmium	1.8	5	ug/l	-	-	-	**1 J**	**0.21 J**	-	NA	-	-	-	-
SW6020	7440-70-2	Calcium (Dissolved)			ug/l	**140000 J**	**220000 J**	**220000 J**	**48000 J**	**77000 J**	**150000 J**	NA	**190000 J**	**190000 J**	**160000 J**	**240000 J**
SW6020	7440-70-2	Calcium			ug/l	**130000 J**	**220000 J**	**230000 J**	**110000 J**	**85000 J**	**160000 J**	NA	**190000 J**	**200000 J**	**170000 J**	**250000 J**
SW6020	7440-47-3	Chromium (Dissolved)	11	100	ug/l	-	-	-	**1.2 J**	-	-	NA	-	-	**1 J**	-
SW6020	7440-47-3	**Chromium**	**11**	100	ug/l	-	-	**1 J**	**52 J a**	**2.3 J**	-	NA	-	-	**0.85 J**	**0.82 J**
SW6020	7440-48-4	**Cobalt (Dissolved)**	**1.1**		ug/l	**2 a**	**1.5 a**	**0.86 J**	-	-	**0.67 J**	NA	**1.6 a**	**1.7 a**	**1.9 a**	**3.2 a**
SW6020	7440-48-4	**Cobalt**	**1.1**		ug/l	**2 a**	**2 a**	**1.2 a**	**39 J a**	**1.9 a**	**0.65 J**	NA	**1.5 a**	**1.6 a**	**1.8 a**	**4.1 a**
SW6020	7440-50-8	Copper (Dissolved)	150	1300	ug/l	-	-	-	**3.1**	-	-	NA	-	-	-	-
SW6020	7440-50-8	Copper	150	1300	ug/l	-	-	-	**88 J**	**5.8**	-	NA	-	-	-	-
SW6020	7439-89-6	**Iron (Dissolved)**	**2600**	**300**	ug/l	-	**4600 J ab**	**2000 J b**	-	-	**140**	NA	**35 J**	**76 J**	**1100 J b**	**2600 b**
SW6020	7439-89-6	**Iron**	**2600**	**300**	ug/l	**40 J**	**4600 J ab**	**2500 J b**	**80000 J ab**	**2100 J b**	**66 J**	NA	**250**	**270**	**830 J b**	**3800 ab**
SW6020	7439-92-1	Lead (Dissolved)	15	15	ug/l	-	-	-	-	-	-	NA	-	-	**0.95**	-
SW6020	7439-92-1	**Lead**	**15**	**15**	ug/l	-	-	**0.61**	**81 J ab**	**2.6**	-	NA	-	-	**0.55**	**0.88**
SW6020	7439-95-4	Magnesium (Dissolved)			ug/l	**30000**	**40000**	**41000**	**4200**	**7800**	**33000**	NA	**32000 J**	**33000**	**36000**	**57000**
SW6020	7439-95-4	Magnesium			ug/l	**28000**	**42000**	**42000**	**25000 J**	**9300**	**35000**	NA	**33000**	**34000**	**37000**	**58000**
SW6020	7439-96-5	**Manganese (Dissolved)**	**88**	**50**	ug/l	**430 ab**	**810 ab**	**360 ab**	**100 ab**	**160 ab**	**490 J ab**	NA	**1500 J ab**	**1600 J ab**	**160 ab**	**450 J ab**
SW6020	7439-96-5	**Manganese**	**88**	**50**	ug/l	**410 ab**	**910 ab**	**380 ab**	**2600 J ab**	**250 ab**	**490 J ab**	NA	**1500 J ab**	**1500 J ab**	**270 ab**	**520 J ab**
SW6020	7439-98-7	Molybdenum (Dissolved)	18		ug/l	**4.7**	**6.6**	**4.1**	**11**	**6.7**	-	NA	**1.9 J**	**1.9 J**	**2.7 J**	**1.9 J**
SW6020	7439-98-7	Molybdenum	18		ug/l	**5.6**	**7.3**	**4**	**18 J**	**2.5 J**	-	NA	**1.9 J**	**2.8 J**	**3.5 J**	**2.7 J**
SW6020	7440-02-0	Nickel (Dissolved)	73		ug/l	**4.9**	**6.7**	-	-	-	**1 J**	NA	**3.4**	**3.6**	**4.4**	**3.5**
SW6020	7440-02-0	**Nickel**	**73**		ug/l	**6**	**5.3**	**3.1**	**87 J a**	**3.9**	**0.87 J**	NA	**3.3**	**3.5**	**4.2**	**4.6**
SW6020	7440-09-7	Potassium (Dissolved)			ug/l	-	**5800**	**2700**	**2500**	**4800**	**3100**	NA	**4200**	**4100**	-	-
SW6020	7440-09-7	Potassium			ug/l	-	**5800**	**2600**	**8000 J**	**4800**	**3100**	NA	**4100**	**4400**	**2500**	-
SW6020	7782-49-2	Selenium (Dissolved)	18	50	ug/l	-	-	-	**1.9 J**	-	-	NA	-	-	**0.54 J**	-
SW6020	7782-49-2	Selenium	18	50	ug/l	-	-	-	**8.7 J**	-	-	NA	-	-	-	-
SW6020	7440-22-4	Silver	18	100	ug/l	-	-	-	**0.16 J**	-	-	NA	-	-	-	-
SW6020	7440-23-5	Sodium (Dissolved)			ug/l	**270000**	**220000**	**330000**	**460000**	**44000**	**370000 J**	NA	**340000 J**	**350000 J**	**59000**	**13000 J**
SW6020	7440-23-5	Sodium			ug/l	**260000**	**220000**	**360000**	**450000**	**43000**	**380000 J**	NA	**340000 J**	**340000 J**	**62000**	**12000 J**

Table 3-13 – continued
Nike Site CL-48 Site Inspection
Detected Constituents - Groundwater

					Sample Location:	MW01-LA1	MW02-LA2	MW03-LA2	MW04-LA2	MW05-LA2	MW06-LA3	MW06-LA3	MW07-LA4	MW07-LA4	MW10-LA0	MW11-LA0
					Sample ID:	MW01G001LA1	MW02G001LA2	MW03G001LA2	MW04G001LA2	MW05G001LA2	MW06G001LA3	MW06H001LA3	MW07G001LA4	MW07H001LA4	MW10G001LA0	MW11G001LA0
					Sample Date:	12/3/2008	12/3/2008	12/4/2008	12/4/2008	12/4/2008	12/3/2008	12/3/2008	12/3/2008	12/3/2008	12/4/2008	12/2/2008
					Sample Type:	N	N	N	N	N	N	FD	N	FD	N	N
					Matrix:	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
Method	**CAS No.**	**Analyte**	**EPARSL WG (a)**	**EPA MCL (b)**	**Units**											
SW6020	7440-28-0	**Thallium**	**0.24**	2	ug/l	-	-	-	**0.76 J a**	-	-	NA	-	-	-	-
SW6020	7440-62-2	Vanadium (Dissolved)	26		ug/l	-	-	-	**1.3 J**	-	-	NA	-	-	**1.2 J**	-
SW6020	7440-62-2	**Vanadium**	**26**		ug/l	-	-	**0.42 J**	**70 J a**	**1.8 J**	-	NA	-	-	**1.2 J**	**1.1 J**
SW6020	7440-66-6	Zinc	1100	5000	ug/l	-	-	-	**260 J**	-	-	NA	-	-	-	-
SW7470	7439-97-6	**Mercury**	**0.063**	2	ug/l	-	-	-	**0.093 J a**	-	-	NA	-	-	-	-
SW8270	9999900-32-2	3-Methylphenol/4-Methylphenol	18		ug/l	-	-	-	-	-	-	NA	**0.23 J**	**0.31 J**	-	-
SW8270	117-81-7	**bis(2-Ethylhexyl)phthalate**	**4.8**	**6**	ug/l	-	-	-	-	**7 J ab**	-	NA	-	-	-	-
SW8270	206-44-0	Fluoranthene	150		ug/l	-	-	-	**0.15 J**	-	-	NA	-	-	-	-
SW8270	129-00-0	Pyrene	110		ug/l	-	-	-	**0.13 J**	-	-	NA	-	-	-	-

Notes:

WG = groundwater sample
FD = field duplicate sample
N = normal (primary) sample
EPARSL WG = USEPA Regional Screening Levels for tap water, September 12, 2008
EPA MCL = USEPA Maximum Contaminant Level
µg/L = micrograms per liter
NA = sample was not analyzed for the analyte indicated – See Table 2-1 for list of required analytes
J = estimated value
a = Result is above the Regional Screening Level for tap water
b = Result is above the Maximum Contaminant Level
ab = Result is above the both the Regional Screening Level for tap water and Maximum Contaminant Level
Bold face type indicates detections
Dash (-) indicates analyte undetected in that sample
Analytes not listed were undetected in all samples

3.8 Screening Levels

After verification/validation of data was complete, results were compared to USEPA RSLs, USEPA MCLs, and USEPA Region 5 RCRA Ecological Screening Values (ESVs) to determine the need for additional SI activities, including a human health BRA, SLERA, removal action, other remedial projects, or a request for NFR.

The QAPP and DQO Process Report listed the USEPA Region 9 preliminary remediation guidelines (PRGs) as the basis for human health screening, which were applicable at the time the documents were produced. However, concurrent with preparation of the final QAPP and DQO Process Report, on 12 September 2008, the USEPA revised and published the RSLs, which can be found on the Internet at: http://www.epa.gov/region09/superfund/prg/. These values were used to screen SI data and supersede the Region 9 PRG screening values listed in the QAPP and DQO Process Report and also cited on Table 3-14. A summary of the screening levels used during the former Nike Site CL-48 SI data assessment is in Appendix D with the analytical data.

The initial screening for human health risk was performed for the residential use scenario. The QAPP and DQO Process Report also included possible cross media migration screening for soil-to-groundwater; however, this screening step was not included in identifying COPCs for soil at the Launch Area for the following reasons:

- Groundwater samples were collected; these samples were used in lieu of theoretical soil to groundwater leaching values.

- Potential releases to groundwater occurred nearly 50 years ago; the soil to groundwater pathway should be at equilibrium.

- For those constituents with analytical results below method reporting limits (MRLs), yet exceeding soil to groundwater screening values, the presence of actual groundwater results supersedes theoretical soil to groundwater leaching values.

- There are no users of groundwater for potable purposes near the former Launch Area.

Although no groundwater samples were collected from the former Control Area, the use of soil to groundwater leaching values is not believed to be appropriate for the following reasons:

- Reported constituent concentrations in the former Control Area soil samples are lower than those reported at the former Launch Area; thus, for the reasons stated above, it is unlikely that the reported concentrations would adversely impact groundwater.

- Soil encountered at the former Control Area consisted of clay and silt. The absence of the sandy soil encountered at the former Launch Area would make it less likely for constituents to leach into groundwater at the former Control Area.

- The amount of potential chemical use at the former Control Area was limited.

- The former Boyas Landfill is downgradient of the former Control Area; thus even if groundwater was impacted, the downgradient receptor would be non-potable water.

- There are no users of groundwater for potable purposes near the former Control Area.

3.8.1 Analytical Sensitivity and Screening Levels

Sensitivity is the measure of the concentration at which an analytical method can positively identify and report analytical results. The sensitivity of a given method is commonly referred to as the detection limit. Definitions for common detection limits are defined as follows:

- Method detection limit (MDL) is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero and is analyte, matrix, and laboratory dependent.

- MRL, or limit of quantitation, is a multiple of the MDL and is regarded as the minimum level of target analyte in a sample that can be reliably achieved within specified limits of precision and accuracy.

MRLs are generally the lowest standard of the calibration that will be reported for undetected values; however, if detected, values were reported down to laboratory MDLs. The sensitivity goal, or MDL, for laboratory measurements reported for this project was to at least meet or be lower than the project action levels, when possible. Analytical methods were chosen that would achieve the best detection limits to answer the study questions. Good faith efforts were undertaken to ensure that contaminants could be measured at the lowest achievable levels for the applied method. However, in some cases, current technology used by the analytical methods could not achieve all of the screening levels.

In the QAPP, laboratory MDLs and MRLs were evaluated against the project screening levels – USEPA RSLs, USEPA MCLs, and USEPA Region 5 RCRA ESVs. Table 3-14 summarizes the analytes identified in the QAPP where MDLs and/or MRLs were not anticipated to meet site screening levels.

Table 3-14
Method Detection Limits Exceeding Screening Levels

Method Description	Analytical Method	Matrix	Units	MDL	MRL	MDL< Screen Level	MRL< Screen Level	Screening Level	Screening Level Source
Aluminum	6020	Water	µg/L	26.3	100	Yes	**No**	50 to 200	Secondary MCL
Arsenic	6020	Water	µg/L	0.16	1	**No**	**No**	0.045	Regional Tap
Beryllium	6020	Water	µg/L	0.18	1	Yes	**No**	0.66	Eco PRG
Silver	6020	Water	µg/L	0.07	0.5	Yes	**No**	0.36	Eco PRG
Antimony	6010B	Solid	mg/kg	0.29	2	**No**	**No**	0.270	Eco SSL
Arsenic	6010B	Solid	mg/kg	0.29	1	Yes	**No**	0.3896	Regional Soil
Selenium	6010B	Solid	mg/kg	0.38	1.2	Yes	**No**	0.5200	Eco SSL
Thallium	6010B	Solid	mg/kg	0.33	1.5	Yes	**No**	1.0000	Eco PRG
Mercury	7471	Solid	mg/kg	0.0067	0.0201	**No**	**No**	0.00051	Eco PRG
4,4'-DDD	8081A	Water	µg/L	0.0057	0.05	**No**	**No**	0.000041	Eco PRG
4,4'-DDT	8081A	Water	µg/L	0.0054	0.05	**No**	**No**	0.000041	Eco PRG
Aldrin	8081A	Water	µg/L	0.0043	0.05	**No**	**No**	0.00395	Regional Tap
alpha-BHC	8081A	Water	µg/L	0.0033	0.05	Yes	**No**	0.0040	Eco PRG
alpha-Chlordane	8081A	Water	µg/L	0.0046	0.05	Yes	**No**	0.0370	Eco PRG
beta-BHC	8081A	Water	µg/L	0.0035	0.05	Yes	**No**	0.0040	Eco PRG
Chlordane	8081A	Water	µg/L	0.015	0.1	Yes	**No**	0.0370	Eco PRG
delta-BHC	8081A	Water	µg/L	0.0076	0.05	**No**	**No**	0.0040	Eco PRG
Dieldrin	8081A	Water	µg/L	0.0044	0.05	**No**	**No**	0.00420	Regional Tap
gamma-Chlordane	8081A	Water	µg/L	0.0052	0.05	Yes	**No**	0.0370	Eco PRG
Heptachlor	8081A	Water	µg/L	0.004	0.05	Yes	**No**	0.0069	Eco PRG
Heptachlor epoxide	8081A	Water	µg/L	0.0039	0.05	Yes	**No**	0.00739	Regional Tap
Methoxychlor	8081A	Water	µg/L	0.011	0.1	Yes	**No**	0.019	Eco PRG
Toxaphene	8081A	Water	µg/L	0.051	0.5	Yes	**No**	0.0611	Regional Tap
Aroclor 1221	8082	Water	µg/L	0.121	0.5	**No**	**No**	0.0068	Regional Tap
Aroclor 1232	8082	Water	µg/L	0.202	0.6	**No**	**No**	0.0068	Regional Tap
Aroclor 1242	8082	Water	µg/L	0.157	0.5	**No**	**No**	0.0336	Regional Tap
Aroclor 1248	8082	Water	µg/L	0.237	0.8	**No**	**No**	0.0019	Eco PRG
Aroclor 1254	8082	Water	µg/L	0.063	0.5	**No**	**No**	0.0019	Eco PRG
Aroclor 1260	8082	Water	µg/L	0.075	0.5	**No**	**No**	0.0336	Regional Tap
Aroclor 1262	8082	Water	µg/L	0.25	0.75	**No**	**No**	0.0336	Regional Tap
Aroclor 1268	8082	Water	µg/L	0.163	0.5	**No**	**No**	0.0336	Regional Tap
2,4-D	8151A	Solid	µg/kg	161	667	**No**	**No**	27.2	R5 ESV

Table 3-14 – continued
Method Detection Limits Exceeding Screening Levels

Dinoseb	8151A	Solid	µg/kg	30	90	**No**	**No**	21.8	R5 ESV
1,1,1,2-Tetrachloroethane	8260B	Water	µg/L	0.18	1	Yes	**No**	0.5200	Regional Tap
1,1,2,2-Tetrachloroethane	8260B	Water	µg/L	0.25	1	**No**	**No**	0.0670	Regional Tap
1,1,2-Trichloroethane	8260B	Water	µg/L	0.32	1	**No**	**No**	0.2400	Regional Tap
1,1-Dichloropropene	8260B	Water	µg/L	0.17	1	**No**	**No**	0.055	Eco PRG
1,2,3-Trichloropropane	8260B	Water	µg/L	0.39	1.2	**No**	**No**	0.00960	Regional Tap
1,2-Dibromo-3-chloropropane	8260B	Water	µg/L	0.85	2.6	**No**	**No**	0.0003	Regional Tap
1,2-Dibromoethane	8260B	Water	µg/L	0.24	1	**No**	**No**	0.00650	Regional Tap
1,2-Dichloroethane	8260B	Water	µg/L	0.22	1	**No**	**No**	0.1500	Regional Tap
1,2-Dichloropropane	8260B	Water	µg/L	0.23	1	Yes	**No**	0.3900	Regional Tap
1,4-Dichlorobenzene	8260B	Water	µg/L	0.15	1	Yes	**No**	0.4300	Regional Tap
Benzene	8260B	Water	µg/L	0.16	1	Yes	**No**	0.4100	Regional Tap
Bromomethane	8260B	Water	µg/L	0.44	1.4	Yes	**No**	0.87	Regional Tap Adj.
Carbon disulfide	8260B	Water	µg/L	0.39	5	Yes	**No**	0.9	Eco PRG
Carbon tetrachloride	8260B	Water	µg/L	0.21	1	**No**	**No**	0.2000	Regional Tap
Chloroform	8260B	Water	µg/L	0.13	1	Yes	**No**	0.1900	Regional Tap
cis-1,3-Dichloropropene	8260B	Water	µg/L	0.16	1	Yes	**No**	0.4300	Regional Tap
Dibromochloromethane	8260B	Water	µg/L	0.19	1	Yes	**No**	0.8000	Regional Tap
Hexachlorobutadiene	8260B	Water	µg/L	0.27	1	Yes	**No**	0.8619	Regional Tap
Naphthalene	8260B	Water	µg/L	0.32	1	**No**	**No**	0.14	Regional Tap
Tetrachloroethene	8260B	Water	µg/L	0.14	1	**No**	**No**	0.1100	Regional Tap
trans-1,3-Dichloropropene	8260B	Water	µg/L	0.13	1	Yes	**No**	0.4300	Regional Tap
Vinyl chloride	8260B	Water	µg/L	0.23	1	**No**	**No**	0.0160	Regional Tap
1,1,2,2-Tetrachloroethane	8260B	Solid	µg/kg	1.2	5	**No**	**No**	0.560	SSL Tap
1,2,3-Trichloropropane	8260B	Solid	µg/kg	1.2	5	**No**	**No**	0.088	SSL Tap
1,2-Dibromo-3-chloropropane	8260B	Solid	µg/kg	1.2	5	Yes	**No**	1.8	SSL MCL
1,2-Dibromoethane	8260B	Solid	µg/kg	0.97	5	**No**	**No**	0.3	SSL MCL
Chloroform	8260B	Solid	µg/kg	0.98	5	Yes	**No**	1.10	SSL Tap
Dibromochloromethane	8260B	Solid	µg/kg	0.83	5	Yes	**No**	4	SSL Tap
1,2-Diphenylhydrazine	8270C	Water	µg/L	0.26	5	**No**	**No**	0.0840	Regional Tap
1,4-Dichlorobenzene	8270C	Water	µg/L	0.2	2	Yes	**No**	0.4300	Regional Tap
2,4-Dinitrophenol	8270C	Water	µg/L	3.1	20	Yes	**No**	7.30	Regional Tap Adj.
3,3'-Dichlorobenzidine	8270C	Water	µg/L	0.25	5	**No**	**No**	0.1500	Regional Tap
Anthracene	8270C	Water	µg/L	0.068	1	Yes	**No**	0.7	Eco PRG
Benzidine	8270C	Water	µg/L	8.9	40	**No**	**No**	0.00009	Regional Tap

Table 3-14 – continued
Method Detection Limits Exceeding Screening Levels

Benzo(a)anthracene	8270C	Water	µg/L	0.066	0.2	**No**	**No**	0.0270	Eco PRG
Benzo(a)pyrene	8270C	Water	µg/L	0.044	0.2	**No**	**No**	0.00290	Regional Tap
Benzo(b)fluoranthene	8270C	Water	µg/L	0.042	0.2	**No**	**No**	0.0290	Regional Tap
Benzyl alcohol	8270C	Water	µg/L	2.6	20	Yes	**No**	8.6	Eco PRG
Bis(2-chloroethyl)ether	8270C	Water	µg/L	0.24	2	**No**	**No**	0.0120	Regional Tap
Bis(2-chloroisopropyl)ether	8270C	Water	µg/L	0.2	2	Yes	**No**	0.3200	Regional Tap
Bis(2-ethylhexyl)phthalate	8270C	Water	µg/L	1.9	10	**No**	**No**	0.12	Eco PRG
Carbazole	8270C	Water	µg/L	0.82	5	Yes	**No**	3.40	Regional Tap
Dibenzo(a,h)anthracene	8270C	Water	µg/L	0.057	0.3	**No**	**No**	0.00290	Regional Tap
Di-n-butyl phthalate	8270C	Water	µg/L	0.64	5	Yes	**No**	1.0	Eco PRG
Hexachlorobenzene	8270C	Water	µg/L	0.066	0.5	**No**	**No**	0.0420	Regional Tap
Hexachlorobutadiene	8270C	Water	µg/L	0.25	5	Yes	**No**	0.8619	Regional Tap
Hexachloroethane	8270C	Water	µg/L	0.25	5	Yes	**No**	4.80	Regional Tap
Indeno(1,2,3-cd)pyrene	8270C	Water	µg/L	0.072	0.25	**No**	**No**	0.0290	Regional Tap
Naphthalene	8270C	Water	µg/L	0.1	1	**No**	**No**	0.01	Eco PRG
Nitrobenzene	8270C	Water	µg/L	0.3	1	Yes	**No**	0.34	Regional Tap Adj.
n-Nitrosodimethylamine	8270C	Water	µg/L	2.8	10	**No**	**No**	0.00042	Regional Tap
n-Nitroso-di-n-propylamine	8270C	Water	µg/L	0.15	0.5	**No**	**No**	0.00960	Regional Tap
n-Nitrosopyrrolidine	8270C	Water	µg/L	0.2	5	**No**	**No**	0.0320	Regional Tap
Pentachlorophenol	8270C	Water	µg/L	2.1	10	**No**	**No**	0.5603	Regional Tap
1,2-Diphenylhydrazine	8270C	Solid 3541	µg/kg	14.5	167	**No**	**No**	12	SSL Tap
2,4,6-Trichlorophenol	8270C	Solid 3541	µg/kg	33.5	330	Yes	**No**	320	SSL Tap
2-Chloronaphthalene	8270C	Solid 3541	µg/kg	15.2	167	**No**	**No**	12.2	R5 ESV
3,3'-Dichlorobenzidine	8270C	Solid 3541	µg/kg	48.8	167	**No**	**No**	46.0	SSL Tap
4,6-Dinitro-2-methylphenol	8270C	Solid 3541	µg/kg	40.2	330	Yes	**No**	144	R5 ESV
Benzidine	8270C	Solid 3541	µg/kg	150	670	**No**	**No**	0.0106	SSL Tap
Benzo(a)pyrene	8270C	Solid 3541	µg/kg	3.1	33	Yes	**No**	15.00	Regional Soil
Bis(2-chloroethyl)ether	8270C	Solid 3541	µg/kg	21.7	167	**No**	**No**	0.054	SSL Tap
Bis(2-chloroisopropyl)ether	8270C	Solid 3541	µg/kg	17.4	167	**No**	**No**	1.80	SSL Tap
Dibenzo(a,h)anthracene	8270C	Solid 3541	µg/kg	4.1	33	Yes	**No**	15.00	Regional Soil
Hexachlorobutadiene	8270C	Solid 3541	µg/kg	19.3	167	Yes	**No**	38.0	SSL Tap
Hexachloroethane	8270C	Solid 3541	µg/kg	17.6	167	Yes	**No**	64	SSL Tap
Naphthalene	8270C	Solid 3541	µg/kg	3.4	33	Yes	**No**	11.2	SSL Tap
n-Nitrosodimethylamine	8270C	Solid 3541	µg/kg	35.8	330	**No**	**No**	0.0024	SSL Tap
n-Nitroso-di-n-propylamine	8270C	Solid 3541	µg/kg	23.1	167	**No**	**No**	0.22	SSL Tap

Table 3-14 – continued
Method Detection Limits Exceeding Screening Levels

n-Nitrosopyrrolidine	8270C	Solid 3541	µg/kg	23.8	1670	**No**	**No**	0.34	SSL Tap
Pentachlorophenol	8270C	Solid 3541	µg/kg	122	670	Yes	**No**	140	SSL MCL

Notes:
mg/kg = milligram per kilogram
µg/kg = microgram per kilogram
µg/L = microgram per liter
MDL = method detection limit
MRL = method reporting level
Yellow highlight indicates laboratory method reporting limit is higher than the project screening level.
Tan highlight indicates laboratory method detection limit is higher than the project screening level.
Adj. = Regional Screening Levels adjusted for a target hazard quotient of 0.1 for noncarcinogens
Secondary MCL = National Secondary Drinking water Standard MCL is a non-enforceable guideline regulating contaminants that may cause cosmetic effects and aesthetic effects in drinking water.
Regional Soil = Regional Screening Levels for Chemical Contaminants at Superfund Sites, July 7, 2008 for residential soil
Regional Tap = Regional Screening Levels for Chemical Contaminants at Superfund Sites, July 7, 2008 for tap water
SSL MCL = Soil screening level protective of groundwater based on the MCL, adjusted to represent a DAF of 20
SSL Tap = Soil screening level protective of groundwater based on the Regional tap water screening value, adjusted to represent a DAF of 20
Eco SSL = Ecological soil screening level from the USEPA ECOTOX
Eco PRG = Preliminary Remediation Guidelines for Ecological Endpoints from Efroymson, et al., 1997
R5 ESV = USEPA Region 5 Ecological Screening Value

3.8.2 Analytical Sensitivity – Project Achievement

MRLs and MDLs cited in the QAPP were targets achievable under *optimal conditions*. Physical characteristics, such as moisture content or sample dilutions, affected the actual detection limit achieved.

Appendix D includes all analytical results obtained during the former Nike Site CL-48 SI, and results that were above the site screening levels were notated, including those that were reported as undetected. As stated previously, undetected results were reported to the MRLs, which are the lowest standard of the calibration; however, if detected, values were reported down to laboratory MDLs and were qualified as estimated "J" by the laboratory.

A detailed discussion of the project achievements with regard to detection limits is in Section 3.7 of the DVR included as Appendix E. Several analytes had MRLs that were above the site screening levels, as indicated with a letter following an undetected "U" or "UJ" qualifier. However, the majority of these analytes actually had MDLs that were below the site screening levels, meaning that if detected above the MDL, the laboratory would have reported a positive concentration with the "J" flag. Tables 3-6 through 3-14 of the DVR provide a detailed summary of analytes where the MRL exceeded the site screening levels but the MDLs were generally below the screening levels. Several analytes had both MDLs and MRLs that were above the site screening levels for all samples, as shown in Tables 3-15 through 3-23 of the DVR. The majority of the analytes listed in these tables were anticipated to have MDLs that exceeded site screening levels, except where dilution occurred, as identified in the QAPP and presented in Table 3-14.

3.9 Data Verification and Validation Summary

Data verification is the process of evaluating the completeness, correctness, and conformance/ compliance of a specific data set against the method, procedural, or contractual requirements. *Data validation* is an analyte- and sample-specific process that extends the evaluation of data beyond method, procedural, or contractual compliance (i.e., data verification) to determine the analytical quality of a specific data set. Analytical data generated during this project were subjected to a rigorous process of 100 percent data verification and 10 percent data validation by an independent third-party contractor.

During the verification phase of the review and evaluation process, data were subjected to a systematic technical review by examining all analytical quality control (QC) results and laboratory documentation. The 2006 DoD Quality Systems Manual (QSM) provides detection limit guidance and method quality objectives (MQOs) based on a statistical study from data collected from

environmental laboratories, and the MQOs from this document were used to assess data. The laboratory analytical data were reviewed in accordance with the USACE Louisville District *DoD QSM Supplement, Version 1* (USACE, 2007), *National Functional Guidelines for Inorganic Data Review* (USEPA, 2004), and *National Functional Guidelines for Organic Data Review* (USEPA, 1999), in conjunction with the project-specific QC requirements detailed in the QAPP (TEJV, 2008c) as specified by each specific analytical method. These data review guidelines define the technical criteria, methods for evaluation of the criteria, and actions to be taken resulting from the review of these criteria. The primary objective of this phase was to assess and summarize the quality and reliability of the data for the intended use of the data and to document factors that may affect the usability of the data. This process did not include in-depth review of raw data instrument output or recalculation of results from primary instrument output. The verification and review process included, but was not necessarily limited to, the following parameters:

- Data completeness
- Holding times
- Method detection and reporting limits
- Organic surrogate recoveries
- MS/MSD
- Laboratory duplicates
- Metals post-digestion spike recoveries
- Laboratory control sample (LCS) recoveries
- Inductively coupled plasma interference check samples
- Laboratory method blank results per matrix and concentration level
- Organic tuning
- Initial calibration
- Initial calibration verification (second source)
- Continuing calibration verification
- Organic internal standard areas and retention times
- Metals serial dilutions
- Secondary dilutions

Definitive laboratory data packages were provided for verification and validation. The contents of the definitive data packages included COC forms, cooler receipts and discrepancy forms, case narrative, analysis data sheets, data quality summaries, raw instrument outputs (including manual integration), and raw bench sheets.

Data verification was performed using the USACE Automated Data Review (ADR) software. The ADR software performs error checks for correctness and completeness on the laboratory analytical data. The software also performs a data review on the electronic data that measures integrity of sample results against associated laboratory QC. Prior to performing the electronic review, a comprehensive ADR project library file for all analyzed methods was developed using the detection limit and precision and accuracy goals from the DoD QSM, which were presented in Table 1-1 of the QAPP. The data verification process included reviewing electronic data files received from the laboratory and electronic review of 100 percent of the files by a qualified professional chemist to check project data quality requirements using the USACE ADR software. Elements not reviewed using ADR included calibrations, organic tuning, organic internal standards, metals post-digestion spike recoveries, and metals serial dilutions, which were assessed manually by the chemist. All data verification was documented on check sheets, and samples were qualified as necessary. During data verification, the data were qualified based on the technical assessment of the review criteria. Qualifiers were applied to each analytical result to indicate the usability of the data for its intended purpose. The specific details of the data verification and validation performed on analytical data may be found in Appendix E. The following section provides a summary of the data verification findings and data usability.

3.9.1 Data Usability Summary

The following sections describe completeness, data deficiencies, and data quality and summarize data review findings.

Data usability was evaluated by assuring that all the analytical requests were met, samples were received in the proper condition, and all analyses were performed within the appropriate holding times.

Data generated by project activities were reviewed against the DQO cited in the project DQO Process Report and the QA/QC practices cited in Section 2.6 of the QAPP. Data were separated into three categories: data meeting all DQO, data outside precision or recovery/accuracy criteria, and data considered unusable.

Data falling in the first category (unqualified results) were considered usable by the project. Data falling in the last category (rejected results) are considered not usable. Data falling in the second category had all aspects assessed. Sufficient evidence was found supporting data quality for use in this project; therefore, the data were moved to the first category but were flagged as estimated (with a J-flag) as per USACE Louisville Chemistry Guidelines (LCG) and USEPA guidelines.

Therefore, although the estimated results may be biased high or low, they were usable for risk assessment and interpretation according to LCG and USEPA guidelines.

3.9.2 Completeness Review

Prior to performing data verification and validation, the analytical data packages and electronic data were examined to assess whether they were complete, consistent, and compliant with the requirements outlined in the DoD QSM and QAPP. All analytical data were found to be complete for verification and validation.

The field data package included logbooks, field records, and measurements obtained on the Site. The Field Team Leader reviewed the field data, and completeness problems were identified during this process.

Field Completeness

Groundwater sampling included noncritical field measurements of pH, temperature, specific conductance, turbidity, oxidation-reduction potential, and dissolved oxygen. This information was used to supplement the critical data; it was not needed to make the decision of whether or not remediation is needed but assisted in assessing water chemistry. These data were also used by the sampling team to assess whether groundwater was stable and suitable for sampling after undergoing groundwater purging. The completeness goal for field measurements was greater than 90 percent. All field instruments were appropriately calibrated, no problems were encountered during field testing, and all anticipated measurements were completed; therefore, a completeness of 100 percent was achieved for field measurements.

Analytical Completeness

Completeness is a measure of the amount of valid (nonrejected) data obtained from a measurement system compared to the amount expected to be obtained under correct normal conditions. Laboratory analysis for this project had a completeness goal greater than 95 percent to account for unanticipated results that may be rejected during data validation. Analytical completeness was calculated using the following equation:

$$\%Completeness = \frac{No.\ of\ Valid\ Tests}{Total\ Tests\ Taken} x100$$

A total of 10,710 measurements were analyzed (number of unique sample and parameter pairs). Of this total, five undetected antimony results were rejected due to low matrix spike percent

recoveries (MS %Rs). It should be noted that two SVOC samples were reanalyzed due to poor LCS recoveries, and although the re-analyzed results were rejected due to holding time exceedance, the original results (which were not rejected) were selected for interpretation with the appropriate qualifiers. Analytical testing completeness was calculated to be 99.95 percent.

3.9.3 Deficiencies in the Data

A total of 10,710 total measurements were conducted, 2,053 of which were qualified as estimated (J-flagged), 141 were qualified as undetected (U-flagged) due to blank artifacts, and five antimony results were rejected (R-flagged). A summary of results qualified during data review are shown on Table 3-15. Some parameters were qualified for multiple reasons. The majority of the qualified parameters were due to calibration outliers, matrix spikes, and values reported below the reporting limit.

Table 3-15
Qualified Results Summary

QC Element	Number of Results Qualified
Reporting Limits	512
Holding Times	250
Method Blanks	66
Equipment Blanks	113
Organic Surrogates	83
Matrix Spikes	593
Laboratory Duplicates	108
Laboratory Control Samples	138
Initial Calibration	558
Initial Calibration Verification	223
Method Reporting Limit Standard	75
Internal Standard Areas	62
Serial Dilutions (Metals)	14

Source of Deficiencies

Five undetected antimony results were rejected due to low MS %Rs.

A total of 512 measurements were flagged as estimated “J” because the values were below the MRL but above the laboratory’s statistically determined MDL. These values are estimated because the results were reported below the linear range of the instrument as determined by the lowest calibration standard. Values in this range may be higher or lower than reported

concentrations because more variability exists below the linear range; these values are, therefore, estimated.

A total of 40 soil pH measurements were qualified due to holding time exceedances; however, they were flagged because a more conservative water holding time of 24 hours was used to assess the data.

Blank artifacts (both laboratory and field; some analytes were qualified for both) accounted for 141 antimony, copper, lead, mercury, molybdenum, naphthalene, nickel, nitrate, potassium, sodium, zinc, and 3-methylphenol/4-methylphenol values being qualified. Analytes attributed to blank contamination were considered to be false-positives and were flagged as undetected "U," as recommended by USEPA validation guidelines.

A total of 781 VOC and SVOC analytes were qualified as estimated due to calibration outliers (initial calibration and initial calibration verification). In addition, 75 metals values were estimated due to MRL outliers. Although these analytes were outside the data review criteria, they were not rejectable, and results were usable as estimated concentrations per Louisville DoD QSM Supplement and USEPA guidelines.

A total of 138 values were qualified due to LCS recoveries, and 62 were qualified due to internal areas outliers. Although these analytes were outside the data review criteria, they were not rejectable, and results were usable as estimated concentrations per Louisville DoD QSM Supplement and USEPA guidelines.

The remaining values qualified during data review were due to surrogate, MS/MSD, and laboratory duplicate outliers that are often indicative of difficult and/or heterogeneous matrices.

Although 2,053 measurements were flagged as estimated (J-flagged) during data review, they are usable for risk assessment and interpretation according to Louisville DoD QSM Supplement and USEPA guidelines.

Flagging Codes for Deficiencies and Usability

Table 3-16 shows final data review qualifiers used to describe results and how they should be interpreted by the end data user.

Table 3-16
Result Flagging Codes

Data Qualifier	Qualifier Definition	Interpret Result As a Detection?	Result Usable?	Potential Result Bias
no qualifier	Acceptable	Yes	Yes	None expected
J	Estimated	Yes	Yes	High or Low
U	Undetected	No	Yes	None expected
UJ	Undetected and Estimated	No	Yes	High or Low
R	Rejected	No	No	Unspecified

Impact on Data Quality

Five antimony values were rejected during data review, and they should not be used; it cannot be determined whether the analyte is present or absent from the sample due to QC failure. Re-sampling and analysis may be necessary to confirm or deny the presence of rejected analytes.

Of the 10,710 total measurements, 8,371 were not qualified during data review. Although 2,053 measurements were flagged as estimated (J or UJ) and 141 were qualified as undetected due to blank artifacts, they are usable for risk assessment and interpretation according to Louisville DoD QSM Supplement and USEPA guidelines.

3.9.4 Data Qualification Summary

Analytical data generated during the former Nike Site CL-48 SI were evaluated independently from the laboratory to assess data quality. The data were subjected to a rigorous process of 100 percent data verification and 10 percent data validation by an independent third-party contractor. During this process, completeness, correctness, and conformance/compliance of results against the method, procedural, or contractual requirements were evaluated. When the QC parameters did not fall within the specific method guidelines, the data evaluator annotated or "flagged" the corresponding compounds. The following bullets summarize qualifications performed during data review.

- 5 values were rejected during data review and should not be used. Re-sampling and analysis may be necessary to confirm or deny the presence of rejected analytes.

- 512 measurements were flagged as estimated "J" because the values were below the MRL but above the laboratory's statistically determined MDL.

- 141 analytes were considered to be false-positives and were flagged as undetected "U" due to blanks artifacts.

- 2,053 measurements were flagged as estimated "J" because one or more QC element was outside of criteria. The specific analytes may have been estimated for multiple reasons, and the values may be biased high or low; however, the results were usable for determining the nature and extent of contamination to meet the project DQO.

- 8,371 measurements had no outliers during data review and were acceptable without qualification.

4.0 SOIL PATHWAY

Figure 4-1 presents the conceptual site model (CSM) for the former Nike Site CL-48. This figure was originally presented as Figure 1-3 in the DQO Process Report (TEJV, 2008) and has been reproduced to clarify the CSM discussed herein. The CSM indicates that exposure to surface and subsurface soil and groundwater are the primary exposure media and pathways in this screening evaluation. Collecting surface water and sediment data was beyond the scope of this SI; therefore, these pathways may be evaluated in the future, as indicated on Figure 4-1.

As shown on the CSM, receptors include future residents, recreational users, site workers, construction workers, and terrestrial species. Exposure routes include ingestion, dermal contact, and inhalation. Pathway evaluation is discussed in Section 4.2.

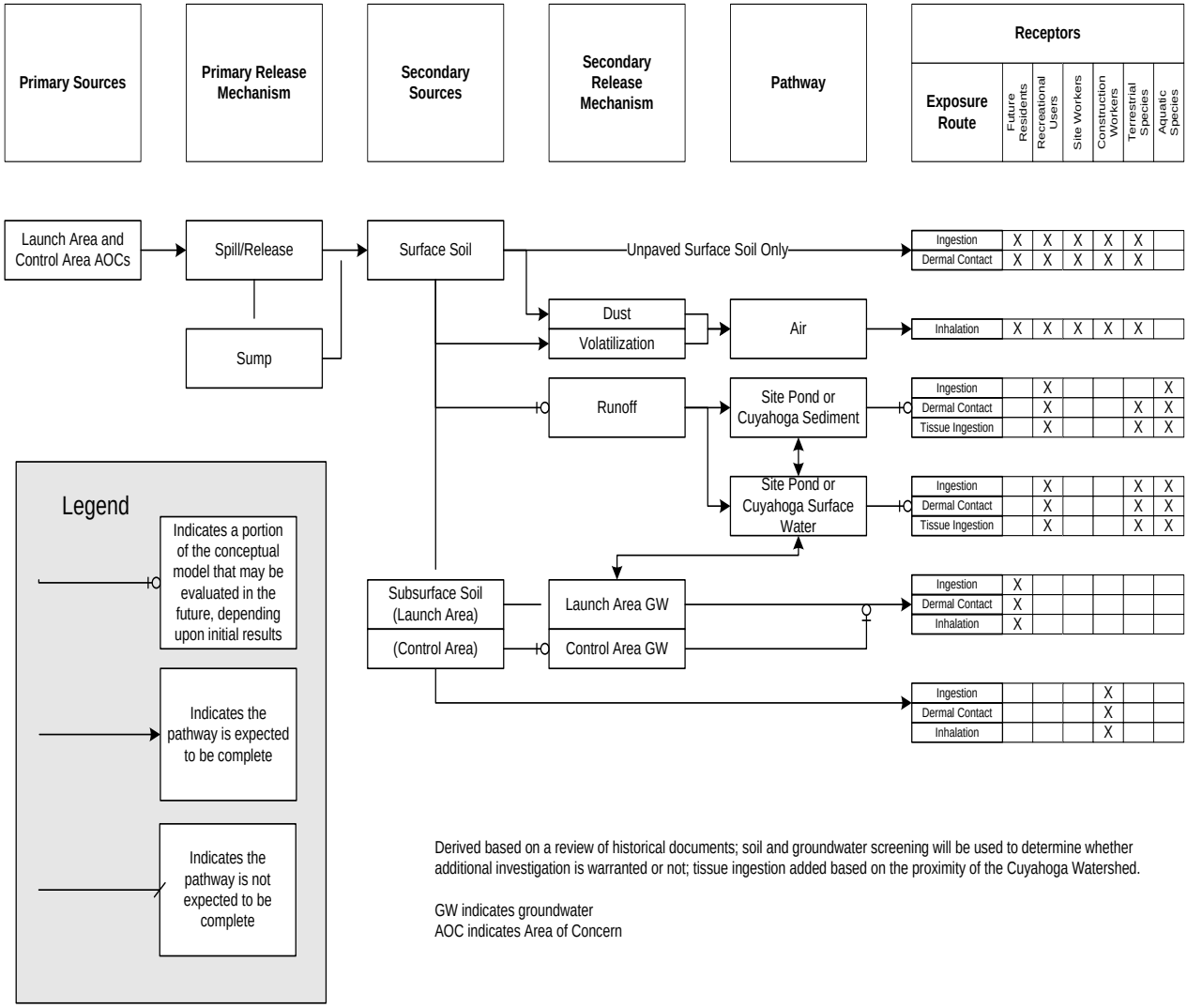
4.1 Natural Background Considerations

Background concentrations are generally considered to be the level or amount of a constituent found in common areas not associated with a particular contaminant release. If concentrations of constituents in soil samples from the site exceed background values, then the site may have residual contamination. Comparison to background concentrations of constituents also provides a relative idea of the degree of contamination. Such comparisons are helpful when addressing contamination in areas that may have been influenced by numerous anthropogenic (nearby roads) and natural activities (weathering, flooding, wind dispersion).

PAHs are found throughout the environment in the air, water, and soil and can remain in the environment for months or years. PAHs come from a variety of sources; the majority of these sources are from the combustion or burning of fuels. Planes, automobiles, asphalt, coal heating, forest fires, and power generation have all greatly contributed to the presence of PAHs in the environment.

This screening evaluation compares site-specific background concentrations to the maximum detected concentrations or the maximum MRL for metals and PAH analytes undetected in soil to assess potential releases of these analytes. The metals and PAH background concentrations were established by collecting eight surface soil samples from locations, not associated from a release, that were agreed upon with the Ohio EPA and USACE. USEPA's ProUCL version 4.00.02 was used to calculate the upper permissible limit background level that was used to screen surface soil samples. Information regarding background calculations is provided in Appendix I.

Figure 4-1
Conceptual Site Model
Nike Site CL-48 Control and Launch Areas



4.2 Potential Human Exposure to Soil

The initial screening for human health risk was performed for the residential use scenario; the residential use scenario is a conservative and protective estimation for recreational, site worker, and construction work scenario. The QAPP and DQO Process Report also included possible cross media migration screening for soil-to-groundwater; however, because groundwater data were collected, this screening step was not included in identifying COPCs for soil at the Site. Calcium,

magnesium, potassium, and sodium were eliminated as COPCs because they are essential nutrients.

The QAPP and DQO Process Report listed the 8 July 2008 USEPA RSL tables as a basis for human health screening, which were applicable at the time the documents were produced. However, concurrent with the final preparation of the QAPP and DQO Process Report, the USEPA issued revised RSLs on 12 September 2008, which can be found on the Internet at: http://www.epa.gov/region09/superfund/prg/. These RSLs supersede the RSL screening values listed in the QAPP and DQO Process Report; therefore, the updated RSLs were used to screen SI data.

4.3 Human Health Risk Screening Results

The human health screening evaluation was completed for surface soil (0 to 12 inches below the surface) and subsurface soil (greater than 12 inches below the surface). Soil sample depth intervals are shown on Tables 3-2 through 3-12. The results are discussed below.

4.3.1 Comparisons to Residential Screening Values

The analytical results were compared to the EPARSL RS using the total combined value for dermal, ingestion, and inhalation pathways. Screening was completed by comparing either the maximum detected concentration or the maximum MRL for undetected analytes to their respective residential soil RSL. As noted in Appendix J and summarized below (Table 4-1), eight constituents were detected at concentrations exceeding screening criteria. An additional 39 constituents had MRLs that either exceeded screening values or were analytes where no screening values were available. These analytes were assessed to evaluate the likelihood of their presence on the former Nike Site CL-48 (Appendix J). To determine if an analyte would be retained as a COPC, additional information, including the principal uses of the analyte and the likelihood of use of the analyte on the Site, were considered. A summary of analytes exceeding residential RSLs is summarized in Table 4-1, along with a determination as to whether the analyte should be retained as a COPC.

Table 4-1
COPC Summary Identifying AOCs for Soil and Rationale
Recreational Land Use – Human Health

Analyte	AOC Surface Soil	AOC Subsurface Soil	Rationale for Inclusion as a COPC
Inorganics			
Aluminum	N	**CA2, LA1, LA3**	**Sub Surface Result > Screening Value**
Cobalt	**CA2, LA5, LA7**	**CA2, LA1, LA2 (>15'), LA3, LA4, LA5, LA7**	**Results > Screening Value**
Iron	N	**LA1, LA2 (>15'), LA3, LA4**	**Sub Surface Result > Screening Value**
Manganese	**LA3, LA7**	**LA1, LA2 (>15'), LA3, LA4, LA5**	**Results > Screening Value**
Mercury	**CA2**	N	**Surface Result > Screening Value**
Selenium	N	**LA2 (>15')**	Sub Surface Result > Screening Value; Only Exceedence > 15 feet below ground surface at LA2– no receptors
Thallium	N	**LA2 (>15')**	Sub Surface Result > Screening Value; Only Detection > 15 feet below ground surface at LA2– no receptors
Semivolatile Organic Compounds			
Benzo(a)anthracene	CA2, LA3	LA2 (>15')	Constituent of asphalt, or no receptors based on depth of samples (depths greater than 15 feet at LA2)
Benzo(a)pyrene	CA2, LA3	LA1, LA2 (>15'), LA3, LA4, LA5	Constituent of asphalt, or no receptors based on depth of samples (depths greater than 15 feet at LA2)
Benzo(b)fluoranthene	CA2, LA3	LA2 (>15')	Constituent of asphalt, or no receptors based on depth of samples (depths greater than 15 feet at LA2)
Benzo(k)fluoranthene	LA3	LA2 (>15')	Constituent of asphalt, or no receptors based on depth of samples (depths greater than 15 feet at LA2)
Chrysene	LA3	N	Constituent of asphalt
Dibenz(a,h)anthracene	CA2, LA3	LA1, LA2 (>15'), LA3, LA5	Constituent of asphalt, or no receptors based on depth of samples (depths greater than 15 feet)
Indeno(1,2,3-cd)pyrene	CA2, LA3	LA2 (>15'), LA3	Constituent of asphalt, or no receptors based on depth of samples (depths greater than 15 feet)

Notes:
COPC — Constituent of Potential Concern
Bold – COPC retained for further consideration

The COPCs retained by this screening evaluation are summarized in Table 4-2. Complete human health screening comparisons are presented in Appendix J.

4.3.2 Summary of Human Health-Based COPCs

Based on residential land use and comparison of the available analytical data against residential RSLs, six metals were identified as COPCs in soil based on residential land use for human health screening. Surface soil had three metals and subsurface soil had five metals as shown in Table 4-2.

Table 4-2
COPC Summary for Soil
Recreational Land Use – Human Health

		Surface Soil				Subsurface Soil			
Method	Analytes	Frequency of Detection	Number Exceeding in Control Area AOCs	Number Exceeding in Launch Area AOCs	COPC Y/N	Frequency of Detection	Number Exceeding in Control Area AOCs	Number Exceeding in Launch Area AOC	COPC Y/N
Metal	Aluminum	Result<SV	0	0	N	29/29	1	3	Y
Metal	Cobalt	15/15	1	3	Y	29/29	1	23	Y
Metal	Iron	Result<SV	0	0	N	29/29	0	5	Y
Metal	Manganese	15/15	0	2	Y	29/29	0	13	Y
Metal	Mercury	13/15	1	0	Y	Result<SV	0	0	N

Notes:
COPC — Constituent of Potential Concern
AOC — Areas of Concern
SV — Screening Values (maximum background or EPARSL RS)

As discussed in Section 4.3.1, an additional nine analytes were identified where either the MRL exceeded screening values or no screening values were available. These analytes were assessed to evaluate the likelihood of their presence on the former Nike Site CL-48. As noted in Table 4-1, these analytes were either associated with compounds or processes that never occurred on the former Nike Site CL-48 or were associated with processes that can be attributed to non-DoD uses (such as the presence of asphalt).

Figures 3-1 and 3-2 show the Control Area AOCs and the Launch Area AOCs, respectively. The COPCs listed above should be included in further site investigations unless additional information suggests no release was likely.

4.4 Potential Ecological Exposure

The CVNP is adjacent to the Site. An assessment of viable ecological receptors on the CVNP or the Site was not conducted as part of the screening level investigation conducted for this project.

4.4.1 Ecological Risk Screening Results

A SLERA was completed to determine whether ecological risks could occur to receptors in the CVNP. The SLERA was conducted in accordance with USEPA guidance – Issuance of Final Guidance: Ecological Risk Assessment and Risk Management Principles for Superfund Sites, OSWER Directive 9285.7-28P, 1999; Process for Designing and Conducting Ecological Risk Assessments, EPA 540-R-97-006, OSWER Directive 9285.7-25, 1997; and Ohio EPA Ecological Risk Assessment (ERA) Guidance found at: http://www.epa.state.oh.us/derr/rules/RR-031.pdf. An ecological checklist evaluating potential receptors and habitat was not prepared as part of this screening level investigation.

The Ohio EPA ERA Guidance, available at: http://www.epa.state.oh.us/derr/rules/RR-031.pdf indicates that the ecological soil screening hierarchy includes:

1) USEPA Ecological Soil Screening Levels (Eco-SSL) http://www.epa.gov/ecotox/ecossl/

2) PRGs for Ecological Endpoints, Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones, August 1997, ES/ER/TM-162/R2, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831, http://www.esd.ornl.gov/programs/ecorisk/documents/tm162r2.pdf.

To complete the SI objective of the SLERA, surficial soil samples collected at the site (0 to 12 inches) were screened by comparing each analyte to its respective screening values as indicated below:

- If applicable, screening concentrations (the maximum detected concentration, or the maximum MRL concentration for analytes undetected) were compared to the site-specific background concentrations (if available) for each constituent detected. When screening concentrations exceeded both background concentrations and USEPA Region 5 ESVs, the constituent was identified as a chemical of potential ecological concern (COPEC). When concentrations did not exceed both background concentrations and ESVs, the constituents were not identified as COPECs.

- If USEPA Region 5 ESVs were not available, the screening concentrations were compared to the Eco-SSL and then the ecological PRGs as recommended in Section 3.3.5 of the Ohio EPA ERA Guidance.

- If no ESV was available, comparisons were made to background.

- If a chemical was detected and no ESV or background screening value was available, the chemical was identified as a COPEC.

To determine if an analyte would be retained as a COPEC, additional information, including the principal uses of the analyte and the likelihood of use of the analyte on the Site, were considered. As noted in Appendix J and summarized below (Table 4-3), 13 constituents were detected at concentrations exceeding screening criteria. An additional 48 constituents had MRLs that either exceeded screening values or were analytes where no screening values were available. These analytes were assessed to evaluate the likelihood of their presence on the former Nike Site CL-48

(Appendix J). A summary of analytes exceeding ecological screening levels is summarized in Table 4-3, along with a determination as to whether the analyte should be retained as a COPEC.

Table 4-3
COPEC Summary Identifying AOCs for Soil and Rationale
Ecological Receptors

Analyte	AOC	Rationale for Inclusion as a COPEC
Inorganics	**LA7**	**Result > Region 5 Eco-SSL**
Barium	**LA3, LA5, LA7**	**Result > Region 5 Eco-SSL**
Cadmium	**CA2, LA3, LA5, LA7**	**Result > Region 5 Eco-SSL**
Chromium	**CA2, LA5, LA7**	**Result > Region 5 Eco-SSL**
Cobalt	**LA7**	**Result > Region 5 Eco-SSL**
Copper	**LA3**	**Result > Region 5 Eco-SSL**
Lead	**LA3, LA7**	**Results > ECOTOX SSL**
Manganese	**CA2, LA3, LA7**	**Result > Region 5 Eco-SSL**
Mercury	**CA2, LA5, LA7**	**Result > Region 5 Eco-SSL**
Nickel	**CA2, LA5, LA7**	**Result > Region 5 Eco-SSL**
Zinc	**LA7**	**Result > Region 5 Eco-SSL**
Polychlorinated Biphenlys		
Aroclor-1254	CA3	Result > Region 5 Eco-SSL, but < Ohio PRG; no known use by DoD at this AOC*
Semivolatile Organic Compounds		
2,6-Dinitrotoluene	LAB	Result > Region 5 Eco-SSL; however, sample not associated with an AOC
Benzo(a)anthracene	LA3	Result > Region 5 Eco-SSL; constituent of asphalt
Benzo(a)pyrene	LA3	Result > Region 5 Eco-SSL; constituent of asphalt
Chrysene	LA3	Result > Region 5 Eco-SSL; constituent of asphalt
Naphthalene	CA2, LA3	Result > Region 5 Eco-SSL; constituent of asphalt

Notes:

COPEC – Chemical of Potential Ecological Concern
AOC – Area of Concern
Bold – COPC retained for further consideration
Eco-SSL – Ecological Soil Screening Level
ECOTOX SSL – ECOTOX Soil Screening Level from ECOTOX Database Reference Guide at www.epa.gov/ecotox
* – Transformers associated with AOC CA3 were owned and operated by the local utility company (Cleveland Electric Illuminating)

The COPECs identified by this screening evaluation are summarized in Table 4-4. Complete ecological screening comparisons are presented in Appendix J.

4.4.2 Summary of COPECs

Based on ecological risk screening using the available analytical data, 10 metals and nitrate were retained as COPECs:

Table 4-4
Summary of Ecological COPECs

Method	Analyte	Frequency of Detection	Number Exceeding in Control Area AOCs	Number Exceeding in Launch Area AOCs
Metal	Barium	15 / 15	0	1
Metal	Cadmium	15 / 15	0	5
Metal	Chromium	15 / 15	1	4
Metal	Cobalt	15 / 15	1	2
Metal	Copper	15 / 15	0	2
Metal	Lead	15 / 15	0	1
Metal	Manganese	15 / 15	0	1
Metal	Mercury	13 / 15	1	2
Metal	Nickel	15 / 15	1	3
Metal	Zinc	15 / 15	1	4

Notes:
COPEC — Chemical of Potential Ecological Concern
AOC — Area of Concern
SVOC — Semivolatile Organic Compounds

As noted in Section 4.4.1, an additional six analytes were identified where either the MRL exceeded screening values or no screening values were available. These analytes were assessed to evaluate the likelihood of their presence on the former Nike Site CL-48. As noted in Table 4-3, these analytes were generally associated with compounds or processes that can be attributed to non-DoD uses (such as the presence of asphalt or transformers owned by Cleveland Electric Illuminating Company [CEI]).

5.0 GROUNDWATER PATHWAY

5.1 Geologic and Hydrogeologic Setting

A discussion of the geologic and hydrogeologic setting of the former Nike Site CL-48 study area was previously presented in the PA (TEJV, 2007). A summary of that discussion is presented in this section.

Both the Independence and the Garfield Heights sites have surficial glacial deposits overlying Paleozoic bedrock. The Independence site contains the Bogart, Brecksville, Udorthents, and Chili soils (U.S. Department of Agriculture [USDA], 2007). The Bogart is a gravelly sandy loam that is moderately well drained. The Bogart component is centrally situated along the central portion of the former Launch Area operational area. The Brecksville component is in the northwestern corner and southern portion of the property and is composed of silt loam underlain by channery silty clay, channery silty clay loam, and weathered bedrock. This component is well drained but has moderately low water movement in the restrictive layer. The Udorthents component is in the north-central portion of the former Launch Area — north of the former Missile Storage Structures in a portion of the site where construction activities resulted in the disposal of excess soil. Udorthents soils typically have been altered by construction or may be fill or disposal areas, typically composed of silty clay loam, clay loam, silt loam, or loam, and have low permeability rates. In heavy precipitation events, areas not covered with vegetation tend to seal the surface. This protective cover decreases the infiltration rate. The Chili component lies along the ridge crest in the southwestern property corner. This soil is composed of gravelly loams and is moderately well drained, with moderately rapid to rapid permeability rates.

The Garfield Heights site contains the Dekalb-Loudonville complex, Urban Land-Mahoning complex, and Dumps soils (USDA, 2007). The Dekalb-Loudonville complex includes much of the property that is sloped, including areas east and south of developed areas of the site. The Dekalb-Loudonville complex is a mixture of silty clay loam and channery sandy loam with high permeability rates and is typically underlain by shallow bedrock. The Urban Land-Mahoning complex composes much of the developed portions of the property along Briarcliff Drive and where the former Control Area site buildings are located. This soil component is typically composed of silt loam underlain by silty clay loam and clay loam and is somewhat poorly drained. The Dumps soil component is located in the northwestern corner of the property adjacent to the former Boyas Landfill property; based on aerial photograph review, this portion of the property appears to have been wooded since 1938.

Regional geology indicates bedrock composed of sandstone overlying shale at varying depths.

Prior to the SI, some hydrogeologic information for the Launch Area was available from previous site investigations, as discussed in Section 1.5. Groundwater flow beneath the Launch Area was predicted to generally follow surface topography and be eastward.

5.2 Groundwater Use

A detailed discussion of groundwater use and targets in and around the study area was presented in Section 8 of the PA. According to the PA, the City of Cleveland, Division of Water provides potable water via the municipal water distribution system to the former Nike Site CL-48 and surrounding properties. The City of Cleveland draws its water from four intakes located between 3 and 5 miles offshore in Lake Erie. There are no public water supply wells within 6 miles of the former Nike Site CL-48. In 2002, the City of Cleveland public water supply system served nearly 415,000 accounts.

Section 8.1 of the PA report provides a complete discussion of the groundwater pathway. Water well records from the Ohio Department of Natural Resources (ODNR) were checked; as noted in the PA, "The Cuyahoga County Board of Health (CCBH) was contacted regarding the availability of additional boring logs. Mr. Marty Baier, Private Water Well Program Director, stated that CCBH copied all ODNR water well logs and does not believe that CCBH would likely have any water wells not available through the ODNR" (TEJV, 2007). As noted in Section 8.1.2 of the PA, "The closest two wells (within 0.25 miles of the property) were installed west of the former Launch Area at depths of less than 60 feet. Review of the topographic map indicates that the bottom of each well is approximately 40 feet above the surface elevation of the Site" (TEJV, 2007). City water is available to all residents within the Site vicinity. There are no water supply wells at either the Control Area property or the Launch Area property. Groundwater is not used at the former Nike Site CL-48.

5.3 Site Hydrogeology

Groundwater monitoring wells were installed during the SI in the locations identified in the SAP. Monitoring well installation was conducted from 10 to 23 November 2008. No monitoring wells were planned or installed at the Control Area. At the Launch Area, one monitoring well (MW-1) was installed in the former Missile Assembly and Test Building area. Four monitoring wells (MW-2, MW-3, MW-4, and MW-5) were installed in the former Missile Magazine Area. One monitoring well (MW-6) was installed in the former Acid Fueling Area, and one monitoring well (MW-7) was installed near the former septic system/leach field. Four additional monitoring wells (MW-8, MW-9, MW-10, and MW-11) were installed to assess groundwater flow direction at the Launch Area. The

locations of the monitoring wells are shown on Figure 3-5. Details of monitoring well construction are discussed in Section 3.4, and drill logs and well construction logs are in Appendix F.

During the SI, the locations of the three 1985 Envirodyne monitoring wells (W-1, W-2, and W-3) were observed. However, these monitoring wells were not included as part of the SI groundwater monitoring program.

Soil in the SI study area at the Control Area consisted of brown to gray silty clay underlain by weathered shale at approximately 8 feet bgs. Since the subsurface investigation at the Control Area was limited, no further geologic and/or hydrogeologic information was obtained from the SI for this location.

During the SI, several soil borings were drilled at the Launch Area. Soil types varied across the property but generally consisted of alternating layers of gray clay, gray silt, and gray fine sand. In some of the deeper soil borings, weathered red sandstone was encountered at approximately 30 feet bgs. Moisture content generally increased with depth. Soil boring logs for drilled sample locations are in Appendix F.

Site geology and anthropogenic factors appear to affect the occurrence and flow of groundwater. DTW varied across the Launch Area. Groundwater was encountered in the boreholes at depths of approximately 14 feet in monitoring wells located in the western half of the Launch Area. Monitoring wells MW-1 (Missile Assembly and Test Building), MW-6 (Acid Fueling Area), and MW-7 (septic system) were installed at depths of approximately 18 feet bgs. In these areas, lithology appears to be the primary factor with regard to groundwater occurrence and flow. The presence of more permeable silts and sands beneath surficial clay appears to be directly tied to the occurrence of the shallow water table.

In soil borings near the Missile Magazine Area (MW-2, MW-3, MW-4, and MW-5), groundwater was encountered from 20 to 25 feet bgs. According to the PA, footer drains are present at an approximate depth of 24 feet bgs around each of the three magazine structures. The presence of these drains appears to have affected DTW in the area immediately surrounding the Missile Magazine structures. These drains were designed to prevent groundwater from entering the underground structures. Therefore, in order to install viable monitoring wells in this area, the drilling depths and monitoring wells were deeper, ranging from 25 to 35 feet bgs.

Topography and lithology appear to be the primary factors affecting occurrence of groundwater in areas where monitoring wells MW-8, MW-9, MW-10, and MW-11 were installed. However, site disturbance during the development of the Nike facility may also impact the natural groundwater occurrence and flow. Attempts to install viable monitoring wells (MW-8 and MW-9) in the southwestern area of the Launch Area failed. In monitoring well MW-8, saturated conditions were encountered at 18 feet bgs within silt, and the borehole was extended to a depth of 21 feet. Well screen, casing, and filter material were placed in the borehole and left overnight to confirm that groundwater would build in the well. No water was present the following day, and the well materials were removed. The borehole was extended to 29 feet bgs. Split spoon samples and saturated auger cuttings indicated the presence of groundwater. Monitoring well MW-8 was installed to a final depth of 29 feet. In monitoring well MW-9, saturated conditions were encountered at 36 feet bgs within sandy silt, and the borehole was extended to a depth of 40 feet. The borehole was left overnight to confirm that groundwater would build in the well. No water was present the following day, and the borehole was extended to 48 feet bgs. Monitoring well MW-9 was installed to a final depth of 46 feet. Based on observations at other drilling locations, it was determined that clay smearing of the boreholes was inhibiting groundwater from entering the screened portion of the wells. The DTW was recorded on 2 December 2008, prior to the groundwater sampling event, in nine of the 11 SI monitoring wells. Groundwater was not present in monitoring wells MW-8 and MW-9.

The soil boring for monitoring well MW-10 was drilled in the southeast portion of the Launch Area. Groundwater was encountered at approximately 33 feet bgs. Soil boring SB-10 was extended to a depth of 38 feet bgs and converted to monitoring well MW-10. The proximity of footer drains associated with the easternmost Missile Magazine structure may have influenced the DTW in this area.

The soil boring for monitoring well MW-11 was drilled northeast of the Missile Magazines near the bottom of the ravine, approximately 35 feet below the top of the ridge. Groundwater was encountered at approximately 8 feet bgs. Soil boring SB-11 was extended to a depth of 13 feet bgs and converted to monitoring well MW-11.

A survey was completed to obtain coordinates and elevations for the 11 SI monitoring wells. After opening and permitting groundwater within each well to stabilize, DTW measurements were collected with a Heron® model HOIL.1 oil/water interface probe. No sign of free phase product was observed within the monitoring wells. Survey and DTW data are in Appendix B. Table 5-1 summarizes the groundwater elevations.

Table 5-1
Groundwater Elevations
Former Nike Site CL-48, Independence, Ohio
2 December 2008

Location	Depth to Water (feet)	Top Of Casing Elevation (feet)	Groundwater Elevation (feet)
MW-1	13.77	749.98	736.21
MW-2	26.60	753.44	726.84
MW-3	29.95	752.40	723.45
MW-4	22.86	753.31	730.45
MW-5	33.15	747.91	714.76
MW-6	14.25	756.86	742.61
MW-7	10.46	745.50	735.04
MW-8	dry	762.14	NA
MW-9	dry	760.36	NA
MW-10	34.33	746.89	712.56
MW-11	4.20	712.08	707.88

Notes:
NA = Groundwater elevation not available

Figure 5-1 is a groundwater potentiometric surface map constructed using the DTW data collected prior to groundwater sampling on 2 December 2008. The potentiometric surface map indicates that groundwater generally flows to the east across the Site, which is compatible with anticipated flow direction.

5.4 Groundwater Sampling Results and Evaluation for Human Health Impacts

As shown on the CSM, chemicals could migrate from soil to groundwater. Therefore, groundwater was evaluated as an exposure medium. Screening comparisons for the groundwater pathway assume that groundwater will be used as drinking water.

No monitoring well installation or groundwater sampling was conducted in or near the Control Area AOCs. Nine monitoring wells were sampled as part of the SI (MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7, MW-10, and MW-11). Total and dissolved metals analyses were completed on the nine monitoring wells sampled.

5.4.1 Direct Exposure to Groundwater

The groundwater pathway is incomplete since groundwater is not used for drinking water supplies; however, as a conservative screening measure, groundwater data were compared to the USEPA MCLs when available or the EPARSL WG if MCLs were unavailable.

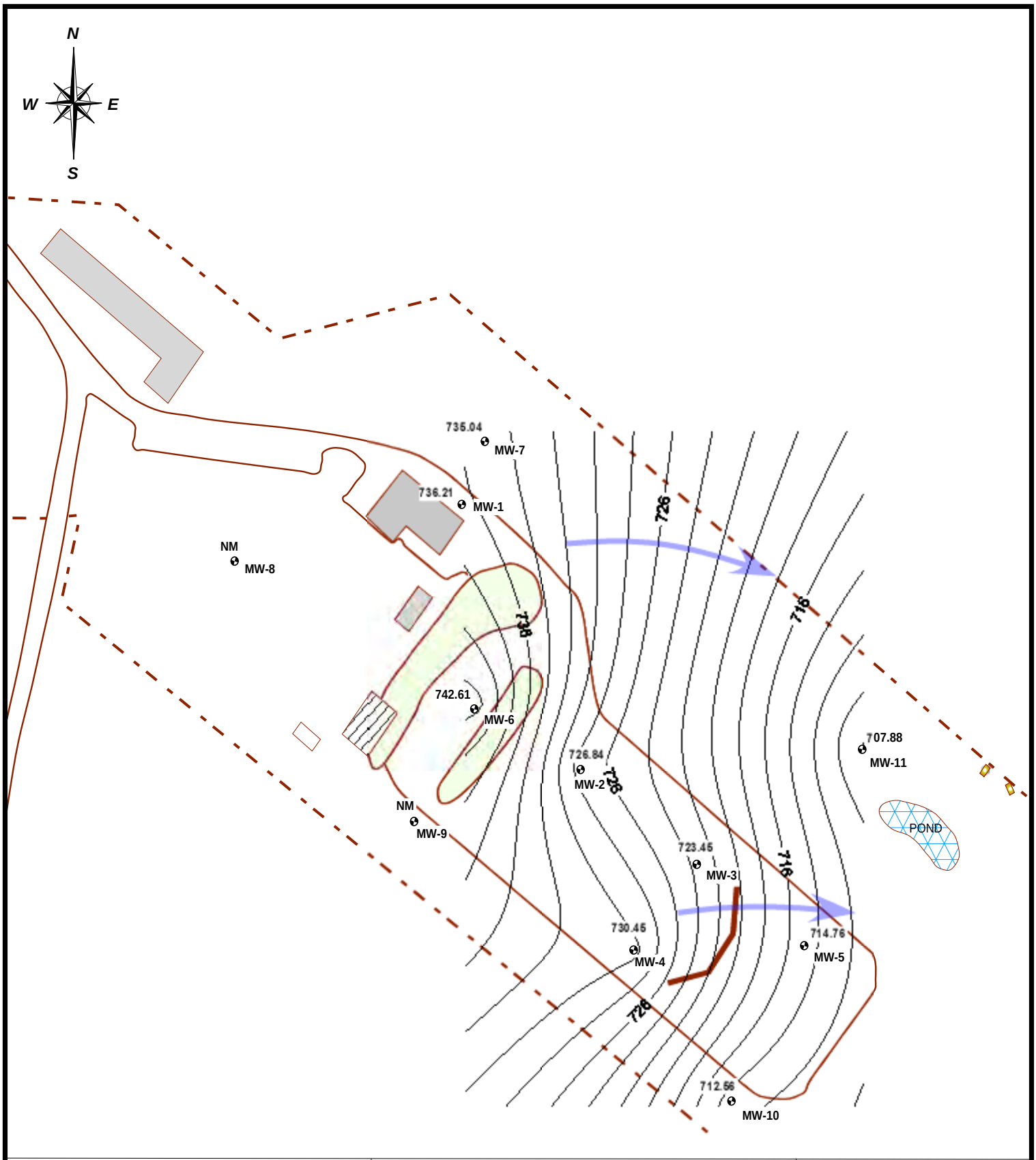


FIGURE 5-1
Potentiometric Surface Map
2 December 2008
FORMER LAUNCH AREA
NIKE SITE CL-48
INDEPENDENCE, OHIO

DATE: 11/19/2009
DRAWN BY: JS/JP

APPROXIMATE SCALE IN FEET:
0 50 100 150

LEGEND

MW-1	GROUNDWATER MONITORING WELL
730.45	POTENTIOMETRIC SURFACE ELEVATION (ft.)
716	POTENTIOMETRIC SURFACE ISOCONTOUR
	APPARENT DIRECTION OF GROUNDWATER FLOW
NM	NOT MEASURED
	FENCE

TERRAINE
ENSAFE
8(a) joint venture

To determine if an analyte would be retained as a COPC, additional information, including the principal uses of the analyte and the likelihood of use of the analyte on the Site, was considered. A summary of analytes exceeding EPARSL WG (either detected or undetected) is summarized in Table 5-2, along with a determination as to whether the analyte should be retained as a COPC.

Table 5-2
COPC Summary for Groundwater
Human Health Receptors

Analyte	COPC	Rationale for Inclusion as a COPC
Inorganics		
Arsenic	**Y**	**Result > Screening Values**
Cobalt	**Y**	**Result > Tap Water Screening Value**
Nickel	**Y**	**Result > Tap Water Screening Value**
Vanadium	**Y**	**Result > Tap Water Screening Value**
Semivolatile Organic Compounds		
bis(2-Ethylhexyl)phthalate	**Y**	**Result > Screening values**

Notes:
COPC – Constituent of Potential Concern
Y – Retained as a COPC

The COPCs identified by this screening evaluation are summarized in Table 5-3. Complete groundwater screening comparisons are presented in Appendix J.

Table 5-3
COPC Summary for Groundwater
Residential Land Use – Human Health

Method	Analytes	Groundwater	Number Total Analytes Exceeding SV	Number Dissolved Analytes Exceeding SV
Metal	Arsenic	16/16	1	0
Metal	Cobalt	14/16	7	4
Metal	Nickel	13/16	1	0
Metal	Vanadium	6/16	1	0
SVOC	bis(2-Ethylhexyl)phthalate	1/8	1	NA

Notes:
COPC — Constituent of Potential Concern
NA — Not Analyzed for dissolved fraction
SVOC — Semivolatile Organic Compounds
SV — screening value

As noted above, an additional 4 analytes were identified where either the MRL exceeded screening values or no screening values were available. These analytes were assessed to evaluate the likelihood of their presence on the former Nike Site CL-48.

6.0 SURFACE WATER PATHWAY

6.1 Hydrologic Setting

The Cuyahoga River flanks the Independence site (Launch Area) east of the R&O Railroad. Two unnamed tributaries of the Cuyahoga River cross the Independence site. One of the tributaries flows north from the central southern end of the property to the northern end of the eastern border of the property and into the Cuyahoga River. The second tributary follows the southwestern property border then curves north to intersect the previously mentioned tributary. In addition to the tributaries to the Cuyahoga River, two small, shallow, man-made ponds are north-northeast of the former Missile Storage Structures. These ponds are west of the tributary that transects the property from south to north. Site topography suggests that the ponds are fed by surface water runoff. These ponds were constructed by the Independence School District in 1967 or 1968, post-dating DoD ownership and use of the Launch Area property.

Based upon visual observation of site features and inspection of historical aerial photographs of the Missile Storage Structures at the Independence site, storm water on the eastern portion of the property (east of the Acid Fueling Area) appears to enter a storm drain system and flow southeast. This storm water would likely follow topography and enter the southwestern tributary to the Cuyahoga River. For the remaining portion of the property (west of the Acid Fueling Area), storm water appears to follow topography and generally flows over asphalt and concrete to the storm drainage system and north toward the Cuyahoga River. The point of entry into the Cuyahoga River is approximately 9 river miles from the point of entry into Lake Erie.

Three storm water ditches surrounding the former Barracks building were observed on the Garfield Heights (Control Area) property during the Site visits. The Erie Canal is approximately 1.5 miles west of the site, and the Cuyahoga River is approximately 2 miles west of the site. Drainage patterns at the former Control Area would flow over concrete and asphalt surfaces to either the ditches on the southeastern portion of the property or into the two storm water catch basins west of the Administration Building, would follow surface topography west to the Erie Canal and the Cuyahoga River, and then would flow approximately 9 river miles northwest to Lake Erie.

6.2 Surface Water Use

According to the PA, the City of Cleveland, Division of Water provides potable water via the municipal water distribution system to the former Nike Site CL-48 and surrounding properties. The City of Cleveland draws its water from four intakes located between 3 and 5 miles offshore in Lake Erie.

Lake Erie is approximately 9 river miles downstream from the former Nike Site CL-48. In 2002, the City of Cleveland public water supply system served nearly 415,000 accounts. Ohio EPA noted that there are no potable intakes along the Cuyahoga River downstream of the former Nike Site CL-48.

The former Nike Site CL-48 is utilized for educational purposes by the Independence Board of Education and the Garfield Heights Board of Education. The former Launch Area is used by the Independence Board of Education as a land lab for students in the local school system. The property includes two classrooms in the Administration Building, a gazebo (north of the former Missile Storage Structures), an oil well and associated tank battery, and dirt trails on the undeveloped portion of the property north and east of the operational portions of the property. While the trails are mostly separated from operational areas of the property by a chain-link fence, there is potential for exposure to surface water and sediment in streams and rivulets that drain the operational portion of the property. The former Control Area has a single ravine along the eastern property border, outside of the fence line. Minor seeps were observed at the base of the ravine; the seeps did not form continuous water flow.

The former Launch Area is bounded on three sides, to the north, south, and east, by the CVNP. National parks are considered sensitive environments under the Hazardous Ranking System. Approximately 500 feet east of the property, within the CVNP, is the Cuyahoga Valley Scenic Railroad. The Towpath Trail, a hiking and biking path, is approximately 0.4 miles east of the property along the former Erie Canal, which was a hand-dug 308-mile waterway connecting Lake Erie to the Ohio River. The Erie Canal is considered an important cultural resource. There are no sensitive environments near the former Control Area.

6.3 Surface Water Sampling

Surface water sampling was not scoped for this SI with the understanding that it may be added if soil or groundwater sampling indicate the presence of a potential risk. Two man-made ponds are north-northeast of the former Missile Storage Structures. These shallow ponds appear to be fed by surface water runoff. Monitoring well MW-11 is located along the walking trail approximately 50 feet northwest of the nearest pond. The DTW is greater than 4 feet bgs, much lower than the surface water elevation within the pond. Because the SI hydrogeologic evaluation does not indicate that groundwater discharges into the ponds, sediment and surface water sampling of the ponds are not recommended for future investigation at this time.

7.0 AIR PATHWAY

The former Nike Site CL-48 is utilized for educational purposes by the Independence Board of Education and the Garfield Heights Board of Education. The former Launch Area is used by the Independence Board of Education as a land lab for students in the local school system. The property includes two classrooms in the Administration Building, a gazebo (north of the former Missile Storage Structures), and dirt trails on the undeveloped portion of the property north and east of the operational portions of the property. While the trails are mostly separated from operational areas of the property by a chain-link fence, there is a potential for exposure to sediment in streams and rivulets that drain the operational portion of the property. The former Control Area has a single ravine along the eastern property border, outside of the fence line. Historically, the Garfield Heights science teachers have maintained a garden for students to grow plants and vegetables at the south end of the property.

Both properties have residential properties near them. The former Launch Area is bordered to the west and south by residential properties and to the north, east, and south by the CVNP. The presence of steep ravines along the south property border and a fence along the western border will tend to reduce the likelihood of trespassing on portions of the property. The former Control Area has residential properties to the east, and, based on the proximity of this dense residential development, the potential for trespassing exists, despite fencing.

No formal air monitoring program was conducted during the SI, and such work was beyond the SOW. Contaminants were assumed to volatilize from soil to air, groundwater to air, or to be entrenched in dust that could be inhaled and ingested based on USEPA Risk Assessment Guidance for Superfund exposure models and the CSM. Decisions in this SI were based upon integrated exposure models that include migration pathways as well as inhalation, ingestion, and dermal contact. Consequently, by evaluating soil and groundwater, the air pathway has been addressed, and no further evaluation of this pathway is necessary.

8.0 SUMMARY AND CONCLUSIONS

This section provides a brief summary of the SI as described in detail in the previous sections and presents conclusions and recommendations for further evaluation. This section is separate from risk evaluation and includes risk management decisions.

8.1 Field Investigation Summary

Field work for the SI was completed from November 2008 through January 2009. Field sampling activities addressed AOCs at both the Control and Launch Areas. Only soil sampling was conducted at the Control Area. Both soil and groundwater sampling were conducted at the Launch Area. Soil sampling and groundwater monitoring well installation were conducted in November 2008. Groundwater sampling was conducted at the Launch Area in early December 2008.

Surface and subsurface soil samples were collected from seven soil borings (SB-1 through SB-7) and two MI sample areas (MI-1 and MI-2) at the Control Area. No monitoring wells were planned or installed at the Control Area. Surface and subsurface soil samples were collected from 28 soil borings (SB-1 through SB-28) and three MI sample areas (MI-1, MI-2, and MI-3) at the Launch Area. Additionally, surface soil samples were collected from eight background locations in the Launch Area (SB-33 through SB-40).

Soil samples were analyzed for VOCs, SVOCs, TAL metals, and pH. One soil sample from the former Missile Magazine Area was also analyzed for PCBs. Soil samples from the former Acid Fueling Area were also analyzed for nitrate. Soil samples from the former septic system/leach field were also analyzed for PCBs, pesticides, and herbicides. Soil samples surrounding both former transformer pads were only analyzed for PCBs. Soil samples from the former Acid Storage Shed were only analyzed for TAL metals, nitrate, and soil pH. Soil samples from the former UST area were only analyzed for VOCs, lead, and TPH-GRO. Soil samples were collected and analyzed for engineering properties within six AOCs. These locations included the former Missile Assembly and Test Building, former Missile Magazine Area, former Acid Fueling Area, former septic system/leach field, former Acid Storage Shed, and former UST area.

Sixty-seven soil samples (primary and duplicate) were analyzed for the SI. Soil COPCs (VOCs, SVOCs, and metals) were detected within most AOCs, except for the Former Transformer Pad at the Launch Area. COPCs were also detected within background soil samples collected at the Launch Area. Analyses of soil engineering properties indicate that soil at the former Nike Site CL-48 consists primarily of clay and silt.

Eleven monitoring wells were installed in November 2008 at the Launch Area. One monitoring well (MW-1) was installed in the former Missile Assembly and Test Building area. Four monitoring wells (MW-2, MW-3, MW-4, and MW-5) were installed in the former Missile Magazine Area. One well (MW-6) was installed in the former Acid Fueling Area. One well (MW-7) was installed near the former septic system/leach field. Four additional monitoring wells (MW-8, MW-9, MW-10, and MW-11) were installed to assess groundwater flow direction at the Launch Area. Groundwater samples were collected in early December 2008 and were analyzed for VOCs, SVOCs, and TAL metals. The groundwater sample from the former Acid Fueling Area was also analyzed for nitrate. Additionally, the groundwater sample from the former septic system/leach field was analyzed for pesticides and herbicides.

Successful completion of two monitoring wells, MW-8 and MW-9, was not achieved during the SI. Eleven groundwater samples (primary and duplicate) were analyzed for the SI from nine monitoring wells. Several groundwater COPCs (metals and SVOCs) were detected within most monitoring wells at the Launch Area. However, COPCs were not detected in MW-6 (LA3 – Acid Fueling Area).

Groundwater levels in the monitoring wells were measured in December 2008. A potentiometric surface map was developed with data from nine monitoring wells. Based on the groundwater elevation data, the groundwater flows in an easterly direction at the Launch Area.

8.2 Soil Pathway

The soil pathway was screened for both human health and ecological risk. Human health evaluations were based on EPARSL RS, and ecological evaluations were based on USEPA Region 5 ESVs.

8.2.1 Human Health Risk Evaluation

The human health risk evaluation was performed using the analytical results from 0 to 12 inches for surface soil and deeper than 12 inches for subsurface samples. Soil sample depth intervals are shown in Tables 3-2 through 3-12. Initially, the soil analytical results were compared to site-specific background concentrations for metals and PAHs and then to the residential RSLs for human health screening.

As noted in Section 4.3.1, 47 analytes were potentially considered as COPCs. Eight of these constituents were detected at concentrations exceeding screening values. The remaining 39 constituents had MRLs that either exceeded screening values or were analytes where no screening

values were available. These analytes were assessed to evaluate the likelihood of their presence on the former Nike Site CL-48. These analytes were found to be associated with compounds or processes that never occurred on the former Nike Site CL-48, were associated with processes that can be attributed to non-DoD uses (such as the presence of asphalt), or were determined to be essential nutrients and were not retained as COPCs.

Based on this screening comparison of soil analytical results, surface soil has three metals retained as COPCs, and subsurface soil has five metals retained as COPCs, as shown in Table 8-1. Future Site investigations should consider these COPCs.

Table 8-1
Summary of Soil COPCs and COPECs

		Human Health		Ecological
Method	**Analyte**	**Surface Soil**	**Subsurface Soil**	**Surface Soil**
Metal	Aluminum	N	**Y**	N
Metal	Barium	N	N	**Y**
Metal	Cadmium	N	N	**Y**
Metal	Chromium	N	N	**Y**
Metal	Cobalt	**Y**	**Y**	**Y**
Metal	Copper	N	N	**Y**
Metal	Iron	N	**Y**	N
Metal	Lead	N	N	**Y**
Metal	Manganese	**Y**	**Y**	**Y**
Metal	Mercury	**Y**	N	**Y**
Metal	Nickel	N	N	**Y**
Metal	Thallium	N	**Y**	N
Metal	Zinc	N	N	**Y**
Nitrate	Nitrate (as N)	N	N	**Y**

Notes:
COPCs — Constituent of Potential Concern
COPECs — Chemical of Potential Ecological Concern
Blue shading and **Y** indicate the analyte has been designated a COPC or COPEC
N=No

8.2.2 Ecological Risk Evaluation

The ecological risk evaluation was performed using analytical results from surficial soil collected from 0 to 12 inches bgs. Surface soil analytical results were compared to site-specific background concentrations for metals and PAHs and then to the USEPA Region 5 ESVs, the ECOTOX screening values, and the Ohio Ecological PRGs.

As noted in Section 4.4.1, 61 analytes were potentially considered as COPECs. Thirteen of these constituents were detected at concentrations exceeding screening values. The remaining 48 constituents had MRLs that either exceeded screening values or were analytes where no screening values were available. These analytes were assessed to evaluate the likelihood of their presence

on the former Nike Site CL-48. These analytes were found to be associated with compounds or processes that never occurred on the former Nike Site CL-48, were associated with processes that can be attributed to non-DoD uses (such as the presence of asphalt), or were associated with chemicals that may have been used by the DoD. However, the absence of similar associated chemicals (e.g., benzene, toluene, ethyl benzene, or xylene associated with petroleum fuels) suggests that these analytes should not be retained as COPECs. Based on this analysis, no undetected analytes with MRLs that either exceeded screening values or where no screening values were available were retained as COPECs.

As shown in Table 8-1, 10 metals and nitrate were identified as COPECs in surface soil. Future Site investigations should consider these contaminants.

8.3 Groundwater Pathway

Human health direct exposure to groundwater was evaluated by comparing the groundwater analytical results to MCLs or EPARSL WG, as summarized below.

8.3.1 Direct Groundwater Exposure

Nine groundwater samples were analyzed for VOCs, SVOCs (with low level PAHs), and total and dissolved metals. A summary of the screening levels used during the data assessment is in Appendix D.

As noted in Section 5.4, 65 analytes were potentially considered as COPCs in groundwater. Five of these constituents were detected at concentrations exceeding screening values. The remaining 60 constituents had MRLs that either exceeded screening values or were analytes where no screening values were available. These analytes were assessed to evaluate the likelihood of their presence on the former Nike Site CL-48. These analytes were found to be associated with compounds or processes that never happened on the Site, were associated with processes that can be attributed to non-DoD uses (such as the presence of asphalt), or were associated with chemicals that may have been used by the DoD. However, the absence of similar associated chemicals (e.g., benzene, toluene, ethyl benzene, or xylene associated with petroleum fuels) suggests that these analytes should not be retained as COPCs. Based on this analysis, no undetected analytes with MRLs that either exceeded screening values or where no screening values were available were retained as COPCs.

Table 8-2
Summary of Groundwater COPCs

Method	Analytes
Metal	Arsenic
Metal	Cobalt
Metal	Nickel
Metal	Vanadium
SVOC	bis(2-Ethylhexyl)phthalate

Notes:
COPC — Constituent of Potential Concern
SVOC — Semivolatile Organic Compound

As shown in Table 8-2, four metals and one SVOC exceeded screening criteria and were identified as COPCs in groundwater. However, although arsenic, cobalt, nickel, and vanadium were detected in six or more groundwater samples, arsenic exceeded its MCL, and cobalt, nickel, and vanadium exceeded their respective EPARSL WG or total metals analysis. Only cobalt exceeded its EPARSL WG or the dissolved metals analysis. There is no potable use of groundwater in the vicinity of the former Nike Site CL-48; therefore, no further investigation of groundwater is recommended at the former Nike Site CL-48.

8.4 Surface Water and Sediment Pathway

Surface water sampling was not scoped for this SI with the understanding that it may be added if soil or groundwater sampling indicate the presence of a potential risk. Two man-made ponds are north-northeast of the former Missile Storage Structures. These shallow ponds appear to be fed by surface water runoff. Monitoring well MW-11 is located along the walking trail approximately 50 feet northwest of the nearest pond. The DTW is greater than 4 feet bgs, much lower than the surface water elevation within the pond. Because the SI hydrogeologic evaluation does not indicate that groundwater discharges into the ponds, and the ponds were created following DoD use of the property, sediment and surface water sampling of the ponds are not recommended for future investigation at this time.

8.5 Air Pathway

No formal air monitoring program was conducted during the SI, and such work was beyond the SOW. Contaminants were assumed to volatilize from soil to air, groundwater to air, or to be entrenched in dust that could be inhaled and ingested based on USEPA Risk Assessment Guidance for Superfund exposure models and the CSM. Decisions in this SI were based upon integrated exposure models that include migration pathways as well as inhalation, ingestion, and dermal contact. Consequently, by evaluating soil and groundwater, the air pathway has been addressed, and no further evaluation of this pathway is necessary.

8.6 Summary

Based on the results of this SI, selected constituents have been reported in soil or groundwater at concentrations exceeding screening criteria. The analytical results were compared to the EPARSL RS using the total combined value for dermal, ingestion, and inhalation pathways. Screening was completed by comparing either the maximum detected concentration or the maximum MRL for undetected analytes to their respective residential RSL. To determine if an analyte would be retained as a COPC, additional information, including the principal uses of the analyte and the likelihood of use of the analyte on the Site, were considered. The groundwater pathway is incomplete since groundwater is not used as a drinking water supply (see Section 5.2); however, as a conservative screening measure, groundwater data were compared to the USEPA MCLs, when available, or the EPARSL WG if MCLs were unavailable. A summary of analytes by AOC is presented below:

8.6.1 Control Area – Former Gasoline UST (CA1)

No constituents were reported above screening criteria. This AOC is not recommended for further assessment

8.6.2 Control Area – Solid Waste Disposal – Hillsides (CA2)

Selected metals and SVOCs were reported in surface and subsurface soil exceeding screening criteria. The metals aluminum, chromium, cobalt, mercury, nickel, and zinc were reported to exceed either residential or ecological screening criteria in surficial soil. The metals aluminum and mercury exceeded subsurface screening criteria. As noted in the Agency for Toxic Substances and Disease Registry's (ATSDR) August 1995 *Toxicological Profile for Polycyclic Aromatic Hydrocarbons,* the SVOCs detected above screening criteria as summarized in Table 3-3 and in Appenix J [i.e., benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene and indeno(1,2,3-cd)pyrene] are constituents of asphalt and were found at lower concentrations in subsurface soil relative to surficial soil. Based on the potential for asphalt cross-contamination, SVOCs were not recommended for further consideration.

8.6.3 Control Area – Former Transformer Pad (CA3)

Aroclor 1254, a PCB, was reported above ecological screening criteria at the former transformer pad but below residential screening criteria. Section 4.2.2.2 of the PA report notes that, "Three 50 kVA transformers were mounted on a concrete pad east of the Administration Building, and were owned by CEI (USACE, 1957; Appendix I, drawing 16-06-48, sheet 13)." The PA report notes that the transformers had been removed by CEI prior to 1972. Although Aroclor 1254 is a compound associated with PCB-containing transformers, as this transformer was owned by CEI and not DoD,

this constituent is not retained as a COPC, and this AOC is not recommended for further assessment.

8.6.4 Launch Area - Former Missile Assembly and Test Building (LA1)

Selected metals and SVOCs were reported in subsurface soil exceeding screening criteria. The metals cobalt, iron, and manganese were reported to exceed residential screening criteria. As noted in the ATSDR's August 1995 *Toxicological Profile for Polycyclic Aromatic Hydrocarbons,* the SVOCs detected above screening criteria as summarized in Table 3-5 and in Appenix J [i.e., benzo(a)pyrene and dibenz(a,h)anthracene] are constituents of asphalt. These SVOCs were found in shallow soil beneath asphaltic pavement and were found to decrease with depth. Based on the potential for asphalt cross-contamination, SVOCs were not recommended for further consideration.

The metals arsenic (dissolved and total), cobalt (dissolved and total), and manganese (dissolved and total) were reported above screening criteria in groundwater samples collected from monitoring well MW-01 near this AOC. VOCs and SVOCs were not reported above MRLs in the sample from this well.

8.6.5 Launch Area – Former Missile Magazine Area (LA2)

Selected metals (including cobalt, iron, manganese, and thallium) and SVOCs were reported above residential screening criteria in soil samples collected from depths of 17 to 25 feet bgs. Based on the absence of viable receptor populations for soil at these depths, these constituents were not retained as COPCs.

The metals aluminum (total), antimony (dissolved), arsenic (dissolved and total), chromium (total), cobalt (dissolved and total), iron (dissolved and total), lead (total), manganese (dissolved and total), mercury (total), nickel (total), thallium (total), and vanadium (total) were reported above screening criteria in groundwater samples from one or more of monitoring wells MW-02, MW-03, MW-04, and MW-05 near this AOC. Bis(2-ethylhexyl)phthalate was the only SVOC reported above screening criteria; this constituent was only reported in well MW-05. VOCs were not reported above MRLs in the samples from these wells. A complete discussion of the groundwater pathway was provided in Section 8.1 of the PA and is summarized in Section 5.2 of this SI. As there is no potable use of groundwater in the vicinity of the former Nike Site CL-48, no further investigation of groundwater is recommended at the former Nike Site CL-48.

8.6.6 Launch Area – Former Acid Fueling Area (LA3)

Selected metals and SVOCs were reported in surface and subsurface soil exceeding screening criteria. The reported metals cadmium, chromium, cobalt, lead, manganese, and mercury were reported to exceed residential and/or ecological screening criteria in surface soil. Reported concentrations of aluminum, cobalt, iron, and manganese were above residential screening criteria in samples collected from depths of 6 to 8 feet. As noted in the ATSDR's August 1995 *Toxicological Profile for Polycyclic Aromatic Hydrocarbons,* the SVOCs detected above screening criteria as summarized in Table 3-7 and in Appenix J [i.e., benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene and indeno(1,2,3-cd)pyrene] are constituents of asphalt. These SVOCs were found in surface soil and shallow soil collected from the gravel acid neutralization pit and were found to decrease with depth. Based on the potential for asphalt cross-contamination, SVOCs were not recommended for further consideration.

The metals arsenic (dissolved and total) and manganese (dissolved and total) were reported above screening criteria in groundwater samples collected from monitoring well MW-06 near this AOC. VOCs and SVOCs were not reported above MRLs in the sample from this well. A complete discussion of the groundwater pathway was provided in Section 8.1 of the PA and is summarized in Section 5.2 of this SI. As there is no potable use of groundwater in the vicinity of the former Nike Site CL-48, no further investigation of groundwater is recommended at the former Nike Site CL-48.

8.6.7 Launch Area – Former Septic System / Leach Field (LA4)

Selected metals and SVOCs were reported in subsurface soil exceeding screening criteria. The metals cobalt, iron, and manganese were reported to exceed residential soil screening criteria. Only one SVOC [benzo(a)pyrene] was reported to exceed screening criteria in a shallow soil sample collected from the leachfield. As benzo(a)pyrene is a common constituent of asphalt, and as it was reported above screening criteria in only one of nine samples, this constituent is not recommended for further consideration.

The metals aluminum (total), arsenic (dissolved and total), cobalt (dissolved and total), and manganese (dissolved and total) were reported above screening criteria in groundwater samples collected from monitoring well MW-07 near this AOC. VOCs, pesticides, herbicides, and PCBs were not reported above MRLs in the samples from this well. SVOCs were not reported above screening criteria in the samples from this well. A complete discussion of the groundwater pathway was provided in Section 8.1 of the PA and is summarized in Section 5.2 of this SI. As there is no

potable use of groundwater in the vicinity of the former Nike Site CL-48, no further investigation of groundwater is recommended at the former Nike Site CL-48.

8.6.8 Launch Area – Solid Waste Disposal – Hillsides (LA5)

Selected metals and SVOCs were reported in subsurface soil exceeding screening criteria. The metals cadmium, chromium, cobalt, manganese, nickel, and zinc were reported to exceed residential and ecological screening criteria in surficial soil samples. No metals exceeded screening criteria in subsurface soil samples. As noted in the ATSDR's August 1995 *Toxicological Profile for Polycyclic Aromatic Hydrocarbons,* the SVOCs detected above screening criteria as summarized in Table 3-9 and in Appenix J [i.e., benzo(a)pyrene and dibenz(a,h)anthracene] are constituents of asphalt, and the reported concentrations decreased with depth. Based on the potential for asphalt cross-contamination, SVOCs were not recommended for further consideration.

8.6.9 Launch Area – Former Transformer Pad (LA6)

No constituents were reported above MRLs. This AOC is not recommended for further assessment.

8.6.10 Launch Area – Former Acid Storage Shed (LA7)

Barium, cadmium, chromium, cobalt, copper, manganese, mercury, nickel, and zinc were reported to exceed residential and/or ecological screening criteria in the surficial soil sample. Cobalt exceeded residential screening criteria in the subsurface soil sample from this AOC.

8.7 Recommendations

Based on the results of this SI, no further action is recommended for the groundwater, surface water, and air pathways. Consequently, groundwater, surface water, and air are not discussed further. Additional action is recommended for the soil pathway.

8.7.1 Recommended Further Action for Soil Pathway

From the human health risk perspective, future investigation should focus on the recreational scenario because the former Nike Site CL-48 is being used for educational purposes for children and because the former Nike Site CL-48 is adjacent to the CVNP. The recreational risk assessment should focus on analytes identified as COPCs for residential risk. As the majority of AOCs are near high traffic human areas, ecological receptors are likely already impacted by human activity – principally the traffic caused by busses. Therefore, potential chemical impacts are not anticipated to be significant risk drivers.

Additional ecological assessment should be completed to determine the availability of habitat for sensitive species as well as the role any site habitat or habitat affected by the site would play in the ecological community. If threatened and endangered species or other sensitive species are present, or if a critical habitat and ecological niche is identified indicating an ecological risk could occur at a population or community level, then an ERA may be warranted; however, if no habitat or sensitive species are present, no further action may be acceptable.

Based on the screening results and areas evaluated above, Table 8-3 summarizes chemicals, media, and AOCs identified as a potential concern.

Table 8-3
Summary of Soil Screening Results

Area of Concern	Aluminum	Barium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Nickel	Zinc
Control Area – Solid Waste Disposal – Hillsides (CA2)	X	--	--	X	X	--	--	--	--	X	X	X
Launch Area – Former Missile Assembly and Test Building (LA1)	--	--	--	--	X	--	X	--	X	--	--	--
Launch Area – Former Acid Fueling Area (LA3)	X	–	X	X	X	--	X	X	X	X	--	--
Launch Area – Former Septic System / Leach Field (LA4)	--	--	--	--	X	--	X	--	X	--	X	X
Launch Area _– Solid Waste Disposal – Hillsides (CA2)	--	--	X	X	X	--	--	--	X	--	X	X
Former Acid Storage Shed	--	X	X	X	X	X	--	--	X	X	X	X

X – identifies a constituent retained as a chemical of potential ecological concern (COPEC) for the specified Area of Concern
-- – constituent is not retained as a COPEC for the specified Area of Concern

SVOCs are excluded from Table 8-3 because, as noted in text, areas where SVOCs were detected above screening criteria were located within close proximity of asphalt pavement or were present in areas where stormwater would be channelized and degraded asphaltic pavement could accumulate. Specifically:

CA2 – Samples were collected from a ravine that collects surface runoff from former Nike Site CL-48 and the adjacent residential property. As noted in Section 7.2.2 of the PA, debris in the ravine

included concrete, wood, plastic, brick, glass, chain-link fencing, barbed wire, porcelain, plastic pots, and fabricated metal parts debris. Roof drains from the residential house (with asphalt shingles) on the adjacent property discharge into the ditch that feeds the ravine.

LA1 – Samples were collected from beneath asphalt pavement.

LA3 – Samples were collected from an area of gravel within a low lying area of concrete pavement that is currently used as a roadway. Asphalt pavement is present on both sides of this section of concrete.

LA5 – Samples were collected from a hillslope below an area that has been covered with asphalt pavement for more than 50 years.

As noted on the ATSDR's Web Page (http://www.atsdr.cdc.gov/toxprofiles/tp69.pdf), sources of PAHs include cigarette smoke, vehicle exhausts, asphalt roads, coal, coal tar, wildfires, agricultural burning, residential wood burning, municipal and industrial waste incineration, and hazardous waste sites. Background levels of some representative PAHs in the air are reported to be 0.02-1.2 nanograms per cubic meter (ng/m^3; a nanogram is one-millionth of a milligram) in rural areas and 0.15-19.3 ng/m^3 in urban areas. A few PAHs are used in medicines and to make dyes, plastics, and pesticides. Others are contained in asphalt used in road construction. They are found throughout the environment in the air, water, and soil.

9.0 REFERENCES

Agency for Toxic Substances and Disease Registry. (1995). *Toxicological Profile for Polycyclic Aromatic Hydrocarbon*. Retrieved from http://www.atsdr.cdc.gov/toxprofiles/tp69.pdf.

Department of Defense. (January 2006). *Quality Systems Manual for Environmental Laboratories*. Retrieved from http://www.navylabs.navy.mil/Archive/DoDV3.pdf.

Efroymson, R.A., Suter II, G.W., Sample, B.E., Jones, D.S. (1997). *Preliminary Remediation Goals for Ecological Endpoints.* Retrieved from http://www.esd.ornl.gov/programs/ecorisk/documents/tm162r2.pdf

Envirodyne Engineers, Inc. (1985). *Final Report, Contamination Evaluation at the Independence Nike Missile Site, Defense Environmental Restoration Program*. Contract DACA-87-85-D-0009, Delivery Order 1. 12161 Lackland Road, St. Louis, Missouri 63146, (314) 434-6960.

Karl R. Rohrer & Associates, Inc. (1993). *Underground Storage Tank (UST) Site Check Report for UST Site at Independence Schools Board of Education, 7733 Stone Road, Independence, Ohio*. 3810 Ridgewood Road, Akron, Ohio 44321, (216) 666-1127.

Ohio Environmental Protection Agency. (9 August 2001). *Pre-CERCLIS Screening Report, Nike CL-48, Garfield Heights/Independence, Cuyahoga County, Ohio.*

Terraine-EnSafe Joint Venture. (2007). *Preliminary Assessment Report for Nike Site CL-48, FUDS Site #G05OH0052, Garfield Heights and Independence, Cuyahoga County, Ohio.* 3 December 2007. Knoxville, Tennessee.

Terraine-EnSafe Joint Venture. (2008a). *Data Quality Objective Process Report, Site Inspection for Nike Site CL-48, FUDS Site #G05OH0052, Garfield Heights and Independence, Cuyahoga County, Ohio.* Knoxville, Tennessee.

Terraine-EnSafe Joint Venture. (2008b). *Work Plan, Site Inspection for Nike Site CL-48, FUDS Site #G05OH0052, Garfield Heights and Independence, Cuyahoga County, Ohio.* Knoxville, Tennessee.

Terraine-EnSafe Joint Venture. (2008c). *Quality Assurance Project Plan, Site Inspection for Nike Site CL-48, FUDS Site #G05OH0052, Garfield Heights and Independence, Cuyahoga County, Ohio.* Knoxville, Tennessee.

Terraine-EnSafe Joint Venture. (2008d). *Sampling and Analysis Plan, Site Inspection for Nike Site CL-48, FUDS Site #G05OH0052, Garfield Heights and Independence, Cuyahoga County, Ohio.* Knoxville, Tennessee.

U.S. Army Corps of Engineers. (1992). *Guidance for Performing Site Inspections Under CERCLA.*

U.S. Army Corps of Engineers. (2001). *Engineer Manual 200-1-3, Engineering and Design — Requirements for the Preparation of Sampling and Analysis Plans.*

U.S. Army Corps of Engineers. (2003). *Defense Environmental Restoration Program, Findings and Determination of Department of Defense Responsibility, Garfield Heights, Nike Site CL-48, Garfield Heights, Ohio.*

U.S. Army Corps of Engineers. (2005). *Federal Facilities Remedial Site Inspection Summary Guide.*

U.S. Army Corps of Engineers, Louisville District (March 2007). *Louisville DoD Quality Systems Manual Supplement, Version 1*.

U.S. Environmental Protection Agency. (1992). *Guidance for Performing Site Inspections Under CERCLA, Interim Final.* Washington, D.C.

U.S. Environmental Protection Agency. (1997). *Process for Designing and Conducting Ecological Risk Assessments,* OSWER Directive 9285.7-25, EPA/540/R-97/006.

U.S. Environmental Protection Agency. (1999). *Issuance of Final Guidance: Ecological Risk Assessment and Risk Management Principles for Superfund Sites*, OWSER Directive 9285.7-28P.

U.S. Environmental Protection Agency. (October 1999). *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*. OSWER 9240.1-05A-P; EPA540/R-99/008. Retrieved from http://www.epa.gov/superfund/programs/clp/download/fgorg.pdf.

U.S. Environmental Protection Agency. (2003). *Region 5 Ecological Screening Levels.* Retrieved from www.epa.gov/reg5rcra/ca/edql.htm.

U.S. Environmental Protection Agency. (August 2003). *Region 5 Resource Conservation and Recovery Act Ecological Screening Values,* http://www.epa.gov/reg5rcra/ca/ESL.pdf.

U.S. Environmental Protection Agency. (October 2004). *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*. OSWER 9240.1-45; EPA540-R-04/004. Retrieved from http://www.epa.gov/superfund/programs/clp/download/inorgfg10-08-04.pdf.

U.S. Environmental Protection Agency. (September 2008). *Regional Preliminary Remediation Guidelines*. Retrieved from http://www.epa.gov/region09/superfund/prg/.

U.S. Environmental Protection Agency. (2008). *Risk-Based Concentration Table Guidance.* Retrieved from www.epa.gov/reg3hwmd/risk/human/pdf/covsep08.pdf.

U.S. Environmental Protection Agency. (May 2009). Maximum Contaminant Levels. Retrieved from http://www.epa.gov/safewater/consumer/pdf/mcl.pdf.

U.S. Environmental Protection Agency. (2009). *Regional Screening Level Tables.* Retrieved from http://www.epa.gov/region09/superfund/prg/.