DEPARTMENT OF THE AIR FORCE
AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT

March 6, 2012

MEMORANDUM FOR: See Distribution List

FROM: AFCEE/EXC - Griffiss
Building 770
428 Phoenix Drive
Rome, New York 13441

SUBJECT: Final Site Closure Report
SS023 (Building 20 AOC)
Former Griffiss Air Force Base (AFB) Rome, New York
Contract Number FA8903-10-D-8595
Delivery Order 0014

1. Accompanying this letter please find the "Final Site Closure Report for SS023 (Building 20 AOC)" for your review and comment.

2. We would appreciate review comments by April 20, 2012 so that project schedules and performance milestones can be maintained in accordance with this PBR Contract.

3. Should you have any questions or concerns please contact me at 315 356 0810 ex 202.

MICHAEL F. MCDERMOTT
Air Force Center for Engineering and the Environment – AFCEE/EXC Griffiss

Attachments: As noted

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Division of Environmental Remediation
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LUC/IC SITE CLOSURE REPORT

Prepared for:

SS023 (Building 20 AOC)
Former Griffiss Air Force Base
Rome, New York

Prepared for:

The Air Force Center for Engineering and the Environment
Building 770
428 Phoenix Drive
Rome, New York 13441

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Contract Number FA8903-10-D-8595

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March 2012

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(provided on CD only)

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LIST OF ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AFCEE	Air Force Center for Engineering and the Environment
ARARs	Applicable or Relevant and Appropriate Requirements
AOC	Area of Concern
CAPE	CAPE Environmental, Inc.
COC	Contaminant of Concern
FPM	FPM Remediations, Inc.
HI	Hazard Index
IRA	Interim Remedial Action
LTM	Long-Term Monitoring
LUC/IC	Land-Use Control/Institution Controls
mg/kg	milligram/kilogram
NFA	No Further Action
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PCB	Polychlorinated Biphenyl
RI	Remedial Investigation
ROD	Record of Decision
SS	Spill Site
SVOC	Semi-Volatile Organic Compound
TAGM	Technical and Administrative Guidance Memorandum
TBCs	To-be-considereds
TRPH	Total Recoverable Petroleum Hydrocarbons
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

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1 Introduction

FPM Remediations, Inc. (FPM), in association with CAPE Environmental, Inc. (CAPE), has been contracted by the Air Force Center for Engineering and the Environment (AFCEE) to evaluate Land use Controls/Institutional Controls (LUC/ICs) at Spill Site (SS) 023 (Building 20 Area of Concern (AOC)). This Closure Report has been prepared through contract number FA8903-10-D-8595-0014.

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2 SS023 (Building 20 AOC)

2.1 Site Description

Building 20 is located in the southeastern central part of the former Griffiss Air Force Base (AFB) at the northeast corner of Otis Street and Ellsworth Road. Building 20 is the Locomotive Roundhouse, which was used to store and service diesel locomotives. Lubricants and diesel locomotive parts were used and stored in the roundhouse, while polychlorinated biphenyls (PCBs) containing hydraulic fluids were used in the locomotives. In 1985, during the renovation of Building 20, the steam distribution system and the floor drain system were found to be broken which allowed waste fluids to leak into a cavity beneath the floor. Approximately 150 to 200 gallons of a free-flowing oily liquid entered the cavity. Remediation of this area resulted in 157 55-gallon drums of liquid waste and contaminated soils being removed.

2.2 Previous Investigations

2.2.1 Subsurface Investigation

In 1986, a subsurface investigation was conducted in the vicinity of the northwest corner of Building 20. Five soil borings were advanced through the concrete floor inside the building and one grab groundwater sample was collected from each soil boring. One permanent monitoring well, B20MW-1, was installed approximately 10 feet north of the northwest corner of the building. Soil sampling results revealed residual hydrocarbon contamination in all borings and residual metals near the surface in the northwest and southwest corners of the building (outside). In 1992, B20MW-1 was sampled on a quarterly basis. Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), and metals were detected; glycols were reported during two of the four sampling events.

2.2.2 Remedial Investigation

In 1994, a Remedial Investigation (RI) was performed at the Spill Site (SS)023 [Building 20 Area of Concern (AOC)] that included the installation of six soil borings, the collection of one grab groundwater sample from one of the soil borings, the installation and sampling of two groundwater wells (B20MW-2 and -3), and the sampling of the existing well B20MW-1. All sampling locations are illustrated in the Building 20 AOC RI report provided in Appendix A.

Analysis of the soil samples collected during the RI field screening indicated that SVOCs exceeded the levels to-be-considered (TBCs) for soils in shallow soils (0 – 2 ft bgs) at boring B20SB-5 (sample B20SB-5B). The SVOCs included benzo(a)anthracene, chrysene, fluoranthrene, phenanthrene, and pyrene. When the RI results are compared to the current NYS Unrestricted Use Soil Cleanup Objectives (Table 375-6.8, 6 NYCRR Part 375, December 2006), only benzo(a)anthracene and chrysene are above the unrestricted use soil cleanup objectives.

Metals exceeded the TBCs in deeper soils at B20SB-2 and -4; however, all metal concentrations, excluding chromium, were above background screening levels. Chromium was detected at location B20SB-2 with a concentration of 27.7 J milligrams per kilogram (mg/kg). The background screening level identified during the RI for chromium is 22.6 mg/kg and the J data qualifier indicates that the concentration is an estimate. In addition, the chromium concentration is below 30 mg/kg, which is the current NYS Unrestricted Use Soil Cleanup Objectives (Table 375-6.8, 6 NYCRR Part 375, December 2006).

Groundwater samples indicated the presence of SVOCs, metals, one pesticide, and total recoverable petroleum hydrocarbon (TRPH) detections above the applicable or relevant and appropriate requirements (ARARs). All sampling results are presented in the Building 20 AOC RI Report provided in Appendix A.

As part of the RI, a baseline risk assessment was performed to evaluate the current and future (industrial use) potential risks to human health and the environment associated with contaminants of concern (COCs) found in the soils and groundwater at the site. Highest risk levels (carcinogenic and non-carcinogenic) were associated with exposure of industrial workers to contaminants in groundwater. The total carcinogenic risk was 1×10^{-4}, equal to the upper end of the United States Environmental Protection Agency (USEPA) target risk range, and the hazard index (HI) was 2.0, which is above the acceptable level of 1. An ecological risk assessment was also performed at the site. The assessment identified that there were no complete exposure pathways for ecological receptors.

2.2.3 Interim Remedial Action

Based on the SVOC exceedances in soil samples collected at location B20SB-5 during the RI, Ocuto Blacktop and Paving Environmental Services conducted an Interim Remedial Action (IRA) at the Building 20 AOC from 1998 to 1999. The IRA Report is provided as Appendix B. Activities included the removal of concrete, soil excavation, and capping of pipelines and floor drains. A 4 foot, 7 inch by 6 foot excavation was completed in October 1998 in the northwest corner of the building. Approximately 2.1 cubic yards were excavated.

One confirmatory sample was collected from the bottom of the excavation and analyzed for VOCs, SVOCs, and PCBs. All sample results were below the project clean limits. Additionally, the results were lower than the current NYS Unrestricted Use Soil Cleanup Objectives (Table 375-6.8, 6 NYCRR Part 375, December 2006), including benzo(a)anthracene and chrysene.

2.3 Record of Decision

The Record of Decision (ROD) for the Building 20 AOC was issued by the Air Force in June 2001 and signed by the USEPA in September 2001. The ROD is provided as Appendix C. Based on the previous investigations and environmental conditions at the site, the selected remedy for the Building 20 AOC is land use control/institutional controls (LUC/ICs) for industrial/ commercial use and groundwater use restrictions. The ROD states that:

- The property will be designated for industrial/commercial use unless permission is obtained from the USEPA, New York State Department of Conservation (NYSDEC), and the New York State Department of Health (NYSDOH); and

- The owner or occupant of the property shall not extract, utilize, consume, or permit to be extracted any water from the aquifer below the ground surface within the boundary of the property unless such owner or occupant obtains prior written approval from the NYSDOH.

2.4 Groundwater Long Term Monitoring

The Air Force performed annual groundwater sampling at the Building 20 AOC in April 2001, March 2002, March 2003, and March 2004 at monitoring wells B20MW-1, -2, and -3 for SVOCs and metals (total and dissolved). No SVOCs were detected at any of the sampling locations during these sampling events. Metals exceedances were reported at all of the sampling locations during each sampling event. The metals exceedances reported in the total metals analysis included cadmium, chromium, iron, magnesium, and sodium. Only iron and sodium exceeded NYS Groundwater Standards in the 2004 sampling round. The metals exceedances reported in the dissolved metals analysis included selenium and sodium.

The exceedances reported in the total metals analysis were attributed to suspended solids in the samples (FPM, November 2004). This is based on the lower number of metals concentrations and number of exceedances observed in the corresponding dissolved metals analysis. The exceedances reported in the dissolved metals analysis were below the reporting limit (selenium) or were attributed to road salt application (sodium). Based on the sampling results from 2001 to 2004, no further groundwater monitoring was recommended at the site and monitoring ceased. The Building 20 AOC section of November 2004 On-Base Groundwater AOCs Long Term Monitoring (LTM) Report is provided as Appendix D.

The remaining Building 20 AOC monitoring wells were decommissioned during the Round 5 well decommissioning event performed in winter 2008/2009. This decommissioning was performed with USEPA approval.

2.5 Site Closure

No further action (NFA) at the Building 20 AOC is recommended. Annual groundwater LTM from 2001 to 2004 confirmed that all groundwater COC concentrations were below NYS Groundwater Standards or attributed to background conditions. Additionally, contaminated soil, identified during the RI at B20SB-5, was excavated from the site and confirmatory soil sampling confirmed that soil cleanup objectives were met. The confirmatory soil sampling results were also below the current NYS Unrestricted Use Soil Cleanup Objectives (Table 375-6.8, 6 NYCRR Part 375, December 2006).

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3 References

AFRPA, *Final Record of Decision for Building 20 Area of Concern at the Former Griffiss Air Force Base, Rome, NY*, June 2001.

FPM Group, Ltd., *Draft Monitoring Report for On-Base Groundwater AOCs, Revision 1.0*, November 2004.

Law Environmental, *Draft-Final Primary Report, Remedial Investigation, Building 20 Locomotive Roundhouse Area of Concern, Volume 21*, December 1996.

Ocuto Blacktop and Paving Environmental Services, *Closure Certification Report for IRA at Building 20, 112, 222, and 255*, March 2001.

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Appendix A
(Building 20 AOC Remedial Investigation)

947 0

File: 17-C-10
M.M.

GRIFFISS AFB
NEW YORK

ADMINISTRATIVE RECORD
COVER SHEET

AR File Number 947

947 1

File:
M.M. I7A-6L
AR 947

UNITED STATES AIR FORCE

GRIFFISS AIR FORCE BASE NEW YORK

DRAFT-FINAL PRIMARY REPORT

VOLUME 21
REMEDIAL INVESTIGATION
BUILDING 20 LOCOMOTIVE ROUNDHOUSE AREA OF CONCERN

11-2588-0211

DECEMBER 1996

947 2

PROJECT NO. 11-2588-0211

CONTRACT NO. DACA41-92-D-8001
JREZ NO. 92-0082

VOLUME 21

DRAFT-FINAL PRIMARY REPORT

REMEDIAL INVESTIGATION
BLDG. 20 LOCOMOTIVE ROUNDHOUSE AREA OF CONCERN

GRIFFISS AIR FORCE BASE, NEW YORK

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Law Engineering and Environmental Services, Inc.
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DECEMBER 1996

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1.0 BACKGROUND AND HISTORY

This section of the Remedial Investigation (RI) report describes the physical location and site characteristics of the Building 20 Locomotive Roundhouse Area of Concern (AOC) and summarizes the site's history and previous site uses.

1.1 SITE BACKGROUND

Building 20, the Locomotive Roundhouse, is located in the south-central portion of the base (Figure 1.1). The Building 20 AOC is located to the west of the Lot 69 AOC and the Coal Storage Yard AOC. In 1985, as part of the steam distribution system project, a new steam entrance into Building 20 was to be constructed at approximately 5 feet below grade at the northwest corner of the building. The construction contractor encountered a concrete conduit at this elevation which housed a previously abandoned steam line. Upon penetration of the foundation, a free-flowing oily liquid was encountered, and approximately 150 to 200 gallons of the liquid entered the excavation. It was determined that a floor drain system within the building had, over the years, developed a break which allowed waste fluids to leak into a cavity beneath the floor. This liquid was released into the excavation when the foundation was penetrated.

Review of the design blue prints for Building 20 indicates that floor drains were connected to the sanitary system. The ultimate point of discharge from the sanitary system associated with Building 20 is to the Rome Publicly Owned Treatment Works (POTW). All recoverable liquid and contaminated soil, concrete, and debris encountered were containerized in 55-gallon drums. Since polychlorinated biphenyls (PCB) hydraulic fluids were sometimes used in locomotives, it was assumed that PCBs may be present; therefore, cleanup was accomplished accordingly. A total of 16 drums of liquid and 141 drums of contaminated soil, concrete, and debris were removed from the excavation and beneath the floor slab. Subsequent analysis of the excavated material reported 109 parts per million (ppm) PCBs, 700 ppm lead, and 446,000 ppm oil and grease. The material was transferred from U.S. Air Force (USAF) custody to the Defense Reutilization and Marketing Office and was subsequently disposed of by an U.S. Environmental Protection Agency (EPA)-approved contractor in 1987 (GAFB, 1987).

1.2 PREVIOUS INVESTIGATIONS

In 1986, Hydro-Environmental Technologies, Inc., (HET) performed subsurface investigations at the northwest corner of Building 20. Five soil borings were advanced through the concrete floor inside the building (Figure 1.2). Soil samples were collected at 2-foot intervals to ground water (encountered at 8 feet below grade). A grab ground-water sample was also collected from each boring. One monitoring well, B20MW-1, was installed approximately 10 feet from the northwest corner of the building (HET, 1986); however, ground water was not sampled from this well. Soil samples and grab ground-water samples from each borehole were analyzed for oil and grease, metals [total metals in aqueous samples, Extraction Procedure Toxicity (EPTOX) metals in soils], PCBs, and 1,1,1-trichloroethane. The results of this sampling effort are summarized in Table 1.1. Residual hydrocarbon contamination, detected as oil and grease, was found in all borings. Residual metals contamination (cadmium, chromium, lead, and zinc) was found primarily in boring B1 near the surface in the northwest corner of the building, and boring B5, located in the southwest corner of the building and drilled in the southernmost service pit and adjacent to the floor drain. PCBs were not detected in any samples, and 1,1,1-trichloroethane was found in the ground-water sample from boring B5 at 0.003 ppm.

In 1992, as part of the quarterly ground-water sampling initiative, monitoring well B20MW-1 was sampled for four consecutive quarters. Samples were analyzed for volatile organic compounds, semi-volatile organic compounds, pesticides, total metals, hexavalent chromium, cyanide, and glycols. The results are presented in Table 1.2. Acetone, chloromethane and methylene chloride were the volatiles detected in the ground water, and diethylphthalate was the only semi-volatile detected. Barium, calcium chromium, iron, magnesium, manganese, nickel, potassium, sodium and zinc were the metals detected, and glycols were detected in two of the four quarters of sampling. Pesticides and cyanide were not detected in any of the quarterly ground-water sampling events.

In accordance with the Federal Facility Agreement and Resolution of Disputes between the USAF, U.S. Environmental Protection Agency, Region II (EPA) and the NYSDEC, an RI was performed at this AOC to evaluate the nature, levels and extent of potential contamination at the site and perform a baseline risk assessment to evaluate the potential effects of chemicals of potential concern (COPCs) on human health and the environment. The following sections overview the field investigations performed at the AOC during the RI, report the results of the investigations, present the baseline risk assessment, and provide conclusions and recommendations for this site based on the data and risk assessment. Background information pertaining to Griffiss AFB and the RI is presented in Volume 1.

2.0 SITE-SPECIFIC INVESTIGATIONS

The purpose of the following sections is to describe the field sampling program performed at the Building 20 AOC. The field investigation activities performed at the Building 20 AOC included the following:

- Drilled six soil borings in the area of the former leaking floor drain
- Collected 19 soil samples from the soil borings for on-site field screening analysis
- Collected four soil samples for confirmatory analysis by the off-site laboratory
- Collected one grab ground-water sample from one of the soil borings
- Drilled, installed, and developed two ground-water monitoring wells
- Collected soil samples from the monitoring well soil borings for visual soil classification; submitted four samples for geotechnical analysis
- Performed tests on the two newly installed monitoring wells (i.e., slug tests) to determine hydraulic conductivity.
- Collected ground-water samples from each newly installed well and one existing well
- Performed topographic and sample location surveys of the monitoring wells

The procedures for visual soil classification, drilling, soil sampling, temporary monitoring well installation, grab ground-water sampling, borehole abandonment, monitoring well installation, well development, slug testing, ground-water sampling, and the methods used for geotechnical analyses performed during the RI are described in Volume 1 of this report.

2.1 SURFACE FEATURE INVESTIGATION

Topographic and location surveys were performed by Whitfield Engineering, Inc., at the Building 20 AOC. The topographic survey established elevations at 2-foot intervals and the location survey established horizontal and vertical coordinates for the soil boring and ground-water monitoring well locations. The plotted topographic survey contour lines are shown on the site maps for this AOC.

2.2 CONTAMINANT SOURCE INVESTIGATION

In May 1992, a visual site reconnaissance was performed at the Building 20 AOC. Data from previous investigations following the cleanup activities at the site indicated the presence of additional contaminated soil and ground water. The purpose of this investigation was to determine whether residual contamination exists in the soils and ground water at the site.

2.3 SOIL INVESTIGATION

The following sections discuss the investigations performed that involved the subsurface soil and ground-water conditions at the site.

2.3.1 Soil Boring Drilling and Sampling

Six soil borings designated B20SB-1 through B20SB-6, were drilled to ground water by Parratt-Wolff, Inc. Soil borings B20SB-1 through B20SB-3 were completed on June 20, 1994, and borings B20SB-4, B20SB-5, and B20SB-6 were completed on July 6, 1994. Borings B20SB-1 through B20SB-3 and B20SB-5 were drilled at the northwestern corner inside Building 20 and borings B20SB-4 and B20SB-6 were drilled at the northwestern corner outside the building. Figure 2.1 shows the location of the soil borings and the HTW Drilling Logs for the soil borings drilled at the Building 20 AOC are included in Appendix A.

Soil samples were collected at 2-foot intervals from the soil surface, below the concrete, to boring completion in each soil boring. Soil sample identification and soil sample intervals for each soil boring are listed below:

Soil Sample Identification	Soil Sample Depth [feet below ground surface (bgs)]
B20SB-1b	1 to 3
B20SB-1c	3 to 5
B20SB-1d	5 to 7
B20SB-2b	0.5 to 2
B20SB-2c	2 to 4
B20SB-2d	5 to 7
B20SB-2e	7 to 9

Soil Sample Identification	Soil Sample Depth [feet below ground surface (bgs)]
B20SB-3b	0.5 to 2
B20SB-3c	2 to 4
B20SB-3d	4 to 6
B20SB-4b	0 to 2
B20SB-4c	2 to 4
B20SB-4d	4 to 6
B20SB-5b	0.5 to 2.5
B20SB-5c	2.5 to 4.5
B20SB-5d	4.5 to 6.5
B20SB-5e	6.5 to 8.5
B20SB-6b	4.75 to 6.75
B20SB-6c	6.75 to 8.75

Soil samples collected from B20SB-1 through B20SB-3 were submitted to the on-site chemical laboratory (MEA, Inc.) for field screening for volatiles, semi-volatiles and pesticides/PCBs. Three additional soil borings (B20SB-4 through B20SB-6) were located based on the field screening results. Soil samples were collected from the additional borings and submitted to MEA, Inc., (MEA) for on-site field screening for volatiles, semi-volatiles, pesticides/PCBs, and metals. The field screening results are included in Appendix E.

Based on the field screening results of all the soil samples, ten percent of the samples with positive hits of metals and semi-volatiles and three of the least contaminated samples were to be submitted to the off-site chemical laboratory for confirmatory analyses. Soil samples from borings B20SB-1 through B20SB-3 were collected in June 1994 and the soil samples from borings B20SB-4 through B20SB-6 were collected in July 1994. Only one sample, B20SB-5b, contained semi-volatiles, based on the field screening. This sample and three of the least contaminated (i.e., lowest concentration of metals) were submitted for confirmatory analysis. The four samples submitted for confirmatory analysis were B20SB-1d, B20SB-2d, B20SB-4d and B20SB-5b. The confirmatory samples were submitted to RECRA Environmental, Inc., (RECRA) for analysis. Soil samples B20SB-4d and B20SB-5b were recollected in November 1994 and analyzed for Methods 8240, 8270, 8080, 418.1, and 6010 (metals). The samples were submitted to Lancaster Laboratories, Inc., (Lancaster) for reanalysis.

The samples collected and the chemical analyses performed are listed in Table 2.1. The analytical parameters and methods performed are listed in Table 2.2.

2.3.2 Grab Ground-Water Sampling

A temporary ground-water monitoring well was installed in boring B20SB-2 to collect a grab ground-water sample using a decontaminated Teflon™ bailer. The well was installed instead of advancing the HydroPunch™ II ground-water sampling tool, as originally proposed, due to the slow ground-water recharge rates and the ineffectiveness of the HydroPunch™ II tool at other AOCs at Griffiss AFB (see Field Adjustment Form 7-1 in Appendix A of Volume 1).

One grab ground-water sample, designated B20HP-2, was collected from the temporary monitoring well on June 20, 1994. The sample was submitted to MEA for on-site field screening for volatiles and semi-volatiles. The sample was not submitted to the off-site chemical laboratory. The field screening results are included in Appendix E.

The temporary well was not developed prior to sampling and no hydraulic conductivity test was performed on the well. The well was removed from the soil boring after sampling and the boring was abandoned.

2.4 GROUND-WATER INVESTIGATION

The following sections discuss the location, installation, development, slug testing, and sampling of the ground-water monitoring wells.

2.4.1 Monitoring Well Locations

Two ground-water monitoring wells, designated B20MW-2 and B20MW-3, were installed at the Building 20 AOC on May 27, 1994, at predetermined locations. The monitoring well locations are shown on

Figures 2.1 and 2.2. Monitoring well B20MW-1, also shown on Figure 2.1, was installed prior to the RI, as discussed in Section 1.0.

2.4.2 Monitoring Well Drilling and Installation

The monitoring wells were drilled and installed on May 27, 1994. The HTW Drilling Logs and the Well Installation Diagrams for the monitoring wells are presented in Appendix B. Soil samples were collected from the monitoring well soil borings continuously at 2-foot intervals from the soil surface below the asphalt to 10 feet bgs and at 5-foot intervals from 10 feet bgs to boring completion.

Two soil samples from each boring were submitted to the off-site physical laboratory for geotechnical analysis based on their stratigraphic and hydrogeologic significance. At a minimum, one soil sample from the unsaturated zone in the soil boring and one sample from the saturated zone were submitted for analysis. The soil samples submitted for geotechnical analysis were:

Monitoring Well Boring	Depth Interval (feet bgs)
B20MW-2	2 to 4
	15 to 17
B20MW-3	6 to 8
	15 to 17

The results of the geotechnical analyses are presented in Appendix C.

2.4.3 Monitoring Well Development

The two newly installed monitoring wells at the Building 20 AOC were developed on June 20, 1994. Monitoring well development water was discharged to the ground surface adjacent to the well, as approved by the New York State Department of Environmental Conservation (NYSDEC). Well Development Data Sheets are located in Appendix B.

2.4.4 Slug Testing

Slug tests were performed on monitoring wells B20MW-2 and B20MW-3 on July 8, 1994, to evaluate the hydraulic conductivity of the screened interval for each well. The results of the reduction of the slug test data (drawdown curves) are included in Appendix D.

2.4.5 Ground-Water Sampling

Dedicated stainless steel bladder pumps and associated equipment were installed in the two newly installed monitoring wells prior to collecting ground-water samples. Ground-water samples, designated B20MW-1, B20MW-2 and B20MW-3, were collected from the two newly installed wells and the one previously existing well on August 7 and August 8, 1994. The ground-water samples were submitted to Lancaster for chemical analysis. The chemical analyses performed on these samples are listed on Table 2.1. The analytical parameters and methods performed are listed on Table 2.2.

The three Building 20 monitoring wells were resampled on April 4, 1995, and the samples were submitted to Lancaster for reanalysis. Wells B20MW-1 and B20MW-2 were re-sampled for Methods 507, 508, 515.1, 632, 9012, and 525.1, and well B20MW-3 was resampled for Method 525.1. The re-sampling for Methods 507, 508, 515.1, 632, and 9012 was necessary because sample fractions for these analytes were not collected with the original samples. The samples were re-analyzed for Method 525.1 because the original analytical results were rejected during the data quality evaluation process.

3.0 SITE-SPECIFIC PHYSICAL CHARACTERISTICS

The following section describes the geological and hydrological properties which were evaluated during the investigation at the Building 20 AOC.

3.1 SITE SETTING

Building 20 is located in the central portion of the base, along the southern margin of the industrial complex. The site vicinity is in an area of low topographic relief estimated at approximately 3 feet.

3.2 SURFACE-WATER HYDROLOGY

Building 20 is not located near any major surface drainage features. The site is located approximately 1,450 feet west of Rainbow Creek, which flows into Sixmile Creek, and approximately 1,500 feet northeast of Threemile Creek. The run-off from the west portion of Building 20 flows to Threemile Creek, and run-off from the east portion of the site flows to Sixmile Creek.

3.3 SOILS

Based on the field description of the soils encountered in soil borings B20SB-1 through B20SB-6 and monitoring wells B20MW-2 and B20MW-3 (below the concrete inside the building and below the asphalt outside the building), the shallow soils consisted of fine to medium sand with silt and/or gravel.

Soil boring B20SB-1 was terminated at 7 feet bgs, boring B20SB-2 was terminated at 7.5 feet bgs, borings B20SB-3 and B20SB-4 were terminated at 8 feet bgs, boring B20SB-5 was terminated at 8.5 feet bgs, boring B20SB-6 was terminated at 8.75 feet bgs, and borings B20MW-2 and B20MW-3 were terminated at 20 feet bgs.

The subsurface soils encountered in the soil borings, based on the visual classifications in the field, were generally fine sand with variable silt and gravel ranging from 2 to 20 feet bgs. The field descriptions and geotechnical classifications of the soil samples collected from the soil borings are included in Table 3.1.

3.4 STRATIGRAPHY

Subsurface information obtained from the drilling of soil borings and monitoring wells at Building 20 was incorporated into a generalized cross section which includes information obtained from the RI. The cross section is a west-east transect. The location of the cross section is shown on Figure 3.1, and the cross section is shown on Figure 3.2.

The correlations shown on Figure 3.2 are interpreted from field descriptions of strata encountered in the depicted soil borings. In some cases, correlations extend between strata which were either not fully penetrated, for which sample recoveries were insufficient for soil description, or for which soil samples were not collected.

Figures 3.1 and 3.2 are attempts to correlate unconsolidated glacial deposits (silt, sand and gravel combinations), represented by natural and fill materials, overlying glacial till material (clay, silt, sand, gravel and rock fragments) and bedrock (shale). The depths to ground water encountered during drilling are shown for soil borings depicted on the cross section.

3.5 HYDROGEOLOGY

Monitoring well B20MW-2 was installed to a depth of 17.2 feet below the top of the well casing (TOC) and well B20MW-3 was installed to a depth of 17.2 feet TOC. Both wells were installed as flush-mount wells, with a protective manhole cover over each well. Based on the historic well diagrams, well B20MW-1 was installed to a depth of 20 feet TOC, and installed with approximately 2.44 feet of riser stickup, inside a protective steel casing.

The shallow ground water investigated at Building 20 exists under unconfined conditions within the unconsolidated aquifer. The saturated zone at Building 20 was encountered while drilling, at depths ranging from 4 feet bgs to 8.5 feet bgs during drilling of the RI soil borings.

The following is a summary of ground-water levels and the dates measured, and the measuring point (TOC) and ground-water elevations of the wells used to determine the ground-water flow direction at the Building 20 AOC.

Well No.	Static Water Level (ft. TOC) Measurement Date	Measuring Pt. Elevation (ft. TOC)	Water Level Elevation (ft.)
B20MW-1	9.33 / 12-01-92	467.22	457.89
	9.90 / 03-04-93	467.22	457.32
	9.29 / 06-08-93	467.22	457.93
	9.61 / 09-13-93	467.22	457.16
	9.48 / 09-04-94	467.19(a)	457.71(b)
B20MW-2	7.44 / 09-04-94	465.09	457.65(b)
B20MW-3	7.38 / 09-04-94	465.02	457.64(b)

(a) Well B20MW-1 was resurveyed at the time the RI wells at Building 20 were surveyed.

(b) Ground-water elevations used to determine the ground-water flow direction.

Wells B20MW-2 and B20MW-3 were installed during the RI with well B20MW-1 being installed during the previous investigation at Building 20. The historic ground-water levels measured in well B20MW-1, prior to the RI, were recorded during the Griffiss AFB quarterly sampling project.

The ground-water flow direction at the Lot 69 AOC is to the west-northwest curving towards the west-southwest at Building 20, as shown on Figure 3.3. The ground-water flow direction was generated using the "Surfer™" computer program, Version 4.15, (produced by Golden Software, Inc.) using the Kriging gridding (all search) method for measured water levels.

Slug tests were performed on wells B20MW-2 and B20MW-3 to estimate the hydraulic conductivity at each well location. The data generated from the in-situ testing were reduced using the AQTESOLV™ computer program, Version 2.0 (Duffield and Rumbaugh, 1994). The program uses the Bouwer and Rice method of estimating the hydraulic conductivity (K) of the formation (Bouwer, 1989). The ground-water level measurements recorded during the "slug in" (rising head) phase of the test were determined to be unsuitable for the estimation of hydraulic conductivity, based on the influence of the unsaturated sandpack on these measurements; therefore, the hydraulic conductivity estimates were based on measurements recorded during the "slug out" (falling head) phase of the test.

The hydraulic conductivity values estimated for the monitoring wells are:

Well	Estimated Hydraulic Conductivity [feet per minute (ft/min)]
B20MW-2	0.013
B20MW-3	0.039

Based on the assigned hydraulic conductivity of 2.08 x 10^{-2} ft/min, a modeled hydraulic gradient of 0.0018 feet/foot (ft/ft), and an estimated effective porosity of 20 percent (expressed as a decimal), the ground-water flow rate was calculated to be 98.39 feet/year (ft/yr) using the Darcy equation:

$$V = \frac{K(i)}{n_e} \times 525{,}600$$

where:

- V = average ground-water flow velocity, in ft/yr
- K = average hydraulic conductivity, in ft/min
- i = hydraulic gradient, in ft/ft
- 525,600 = number of minutes in a year (conversion factor)
- n_e = porosity

4.0 NATURE AND EXTENT OF CONTAMINATION

This section contains information on the nature and extent of contamination at the Building 20 AOC. Information is presented on the sampling program results, analytical results, and interpretation of the analytical results grouped by sample media. The discussion in this section focuses on the chemicals which were detected at concentrations greater than the potential applicable or relevant and appropriate requirements (ARARs), to-be-considered (TBC) criteria, and background levels. The potential ARARs, TBCs, and background levels are presented and defined in Volume 1.

4.1 CONTAMINANT SOURCES

Possible contaminant sources at this AOC include the leaking floor drain inside the northwest corner of the building discovered in 1985 when an oily liquid drained into an utility excavation. High concentrations of oil and grease measured in the excavated materials suggest oils and hydraulic fluids associated with the maintenance of locomotives as a possible source of the oily liquid. The sump located inside the northwest entrance to the building has been identified as another possible contaminant source.

4.2 SAMPLING PROGRAM AND ANALYTICAL RESULTS

This section of the report provides results for the sampling and analysis program. Subsurface soil and ground water were sampled to assess contamination associated with the leaking floor drain.

The complete analytical results are provided in Appendix F. The results of the data quality evaluation for chemical samples collected at this AOC were provided in the "RI Analytical Data Technical Memorandum No. 23," dated January 1995 and the letter addendum dated June 1995 (LAW, 1995a,b).

4.2.1 Soil Investigation

Soil samples were collected and analyzed from the contaminated soil removed from the excavation performed in 1985. Five soil borings were drilled inside Building 20 in 1986 by Hydro-Environmental Technologies, Inc. (HET, 1986). Four soil samples were collected from each soil boring drilled inside the building for chemical analysis for that investigation. For the RI in 1994, six soil borings were drilled and soil samples (19 soil samples) were collected for field screening by MEA on June 20 (B20SB-1 through B20SB-3) and July 26, 1994 (B20SB-4 through B20SB-6). Four soil samples were selected for confirmatory analysis, based on the field screening results.

The analytical results of the soil samples collected for the HET investigation in 1986 are presented in Table 1.1. In the 1986 investigation, oil and grease were detected in all four soil samples collected from borings B1, B2, B3 and B5, and in three of the soil samples collected from boring B4. The highest concentration of oil and grease was detected in the shallow soil sample collected from B1 (at 65 ppm), located in the northwest corner of the building. Lead was detected in the deeper soil samples collected from borings B4 and B5 (at 0.13 ppm in both samples), and zinc was detected in all four soil samples collected from borings B2, B3, B4 and B5, and in three soil samples collected from boring B1. The highest concentration of zinc (0.09 ppm) was detected in the deep soil sample collected from boring B3. Overall, the highest concentrations of oil and grease were detected in the shallow soil samples from the borings, and the highest concentrations of zinc were detected in the deeper soil samples from the soil borings.

Level II Field Screening Results

The analytes detected in the soil samples collected for field screening in 1994 for the RI are included in Table 4.1. Figure 4.1 illustrates detections of analytes in the field screening of the soil samples at the soil boring locations.

Two semi-volatiles and eight metals were detected in the soil samples during field screening. The semi-volatiles (fluoranthene and pyrene) were detected in the 0.5- to 2.5-foot soil sample from boring B20SB-5. Of the metals detected, aluminum, calcium, iron, magnesium and manganese were detected in all the soil samples analyzed. Calcium, cobalt, and zinc were the only metals detected at concentrations above the potential TBCs and background screening levels. Cobalt was detected in the 5- to 7-foot sample from boring B20SB-2, and zinc was detected in the 6.8- to 8.8-foot sample from B20SB-6. Calcium was detected in the 0- to 2-foot sample, the 2- to 4-foot sample, and the 5- to 7-foot sample from boring B20SB-2 at 185,275 mg/kg; 198,017 mg/kg; and 134,199 mg/kg, respectively, and in the 6.8- to 8.8-foot sample from B20SB-6 at 46,813 mg/kg.

Confirmatory Results

The analytes detected in the confirmatory soil samples are listed in Table 4.2. Figure 4.2 illustrates detections of analytes exceeding potential TBCs in the confirmatory soil samples collected. The frequency of detection and exceedance of TBCs for the confirmatory subsurface soil samples is summarized in Table 4.3.

Five volatiles were detected in the confirmatory soil samples at concentrations below potential TBCs. Acetone and toluene were detected in the 4- to 6-foot soil sample in boring B20SB-4 at 4 μg/kg and 2 μg/kg, respectively, and acetone, benzene, ethylbenzene, and total xylenes were detected in the 0- to 2-foot soil sample in boring B20SB-5 at 60 μg/kg, 3 μg/kg, 10 μg/kg, 8 μg/kg, and 56 μg/kg, respectively.

Eighteen semi-volatiles were detected in the confirmatory soil samples, five of which were detected at concentrations exceeding potential TBCs. All five analytes, benzo(a)anthracene, chrysene, fluoranthene, phenanthrene and pyrene, were detected in the 0- to 2-foot soil sample from boring B20SB-5 at 31,000 μg/kg, 38,000 μg/kg, 55,000 μg/kg, 75,000 μg/kg, and 73,000 μg/kg, respectively.

Five pesticides and one PCB compound were detected in the confirmatory soil samples at concentrations below potential TBCs.

A total of 23 metals were detected in the confirmatory soil samples, 10 of which were detected at concentrations exceeding potential TBCs and/or background screening levels. Arsenic, total chromium, silver and sodium were detected at concentrations above potential TBCs in one out the four samples analyzed and calcium in two of the samples. Of the samples detected above potential TBCs, calcium and sodium were detected in B20SB-5 at 34,000 mg/kg and 598 mg/kg, respectively; calcium, chromium, and silver were detected in boring B20SB-2 (drilled in the leaking floor drain) at 74,800 mg/kg, 27.7 mg/kg, and 6.4 mg/kg, respectively; and, arsenic was detected in the 4- to 6-foot soil sample from B20SB-4 (drilled outside the northwest corner of the building) at 4.2 mg/kg. The metals exceeding background screening levels include hexavalent chromium, detected in the 0.5- to 2.5-foot soil sample from boring B20SB-5 at 0.58 mg/kg, and in the 7- to 9-foot sample from boring B20SB-2 at 0.5 mg/kg; selenium, detected in the 4- to 6-foot soil sample from boring B20SB-4 and the 0- to 2-foot sample from boring B20SB-5 at 0.76 mg/kg and 1.11 mg/kg, respectively; cobalt, and molybdenum, detected in the

5- to 7-foot sample from boring B20SB-2 at 19.4 mg/kg and 6.4 mg/kg, respectively; and strontium detected in the 5- to 7-foot sample from boring B20SB-2 at 112 mg/kg and the 0- to 2-foot sample from boring B20SB-5 at 66.7 mg/kg.

Petroleum hydrocarbons were detected in all of the confirmatory soil samples. The highest concentrations of petroleum hydrocarbons were detected in sample B20SB-5b at 4,400 mg/kg.

4.2.2 Ground-Water Investigation

Five grab ground-water samples were collected for analysis from the soil borings drilled inside Building 20 during the 1986 investigation, and one monitoring well (B20MW-1) was installed. The well was not sampled during the 1986 investigation. Well B20MW-1 was sampled during the quarterly ground-water investigation conducted beginning November 1992 and ending September 1993. One grab ground-water sample was collected from the soil boring drilled in the leaking floor drain (B20SB-2) for field screening on June 20, 1994, during the RI. Additionally, two monitoring wells (B20MW-2 and B20MW-3) were installed for the RI on May 27, 1994. Ground-water samples were collected for analysis from the two newly installed wells and one existing well (B20MW-1) on August 7 and 8, 1994, at the Building 20 AOC for the RI.

The analytes detected in the five grab ground-water samples collected during the 1986 investigation are presented in Table 1.1. The detected analytes in the four quarters of ground-water sampling conducted at B20MW-1 in 1992 and 1993 are listed in Table 1.2. The analytes detected in the ground water at the Building 20 AOC in 1994 for the RI are presented in Table 4.4 and the analytes detected in the ground-water at Building 20 in 1995 for the RI are presented in Table 4.5. Figure 4.3 illustrates detections of analytes exceeding potential ARARs in ground water at the three monitoring well locations for the RI. The frequency of detection of exceedance of ARARs or TBCs for ground water for the RI is summarized in Table 4.6.

Of the analytes detected in the five grab ground-water samples collected during the 1986 investigation; oil and grease, cadmium, chromium, lead, nickel, silver and zinc were detected in the grab ground-water samples collected from borings B3 and B4; cadmium, lead, nickel, and zinc were also detected in the grab ground-water sample collected from boring B1; lead, nickel and zinc were detected in the sample from boring B2; and, nickel, zinc, and 1,1,1-trichloroethane were detected in the sample from B5, located in the southwest corner of Building 20.

Ten metals, three volatile organic compounds, one semi-volatile organic compound and total glycols were detected in the ground-water samples during the four quarters of ground-water sampling of B20MW-1 in 1992 and 1993. The analytes detected above potential ARARs in November 1992 were manganese, sodium, and methylene chloride, and barium, calcium, potassium, and zinc were detected above background screening levels. Iron, nickel, sodium, and total glycol were the analytes detected above potential ARARs in March and June 1993, and calcium, potassium, and zinc were detected above background screening levels at those times. Methylene chloride was the only analyte detected above potential ARARs during the quarterly ground-water sampling in September 1993.

No analytes were detected in the field screening of the grab ground-water sample (B20HP-2) collected for the RI (Appendix E).

Four volatiles, seventeen semi-volatiles, eight pesticides, twenty-one metals, and petroleum hydrocarbons were detected in the ground-water samples collected at the Building 20 AOC for the RI. None of the volatiles were detected at concentrations above potential ARARs. Dieldrin was the only pesticide detected at a level exceeding potential ground-water ARARs.

Six of the seventeen semi-volatiles were detected at concentrations above potential ARARs. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene were detected in the ground-water samples collected from well B20MW-2 in 1994 at 0.2 μg/L, 0.2 μg/L, 0.2 μg/L, 0.09 μg/L, 0.3 μg/L, and 0.09 μg/L respectively, and the 1995 resampling event at 0.3 μg/L, 0.2 μg/L, 0.4 μg/L, 0.08 μg/L, 0.4 μg/L, and 0.04 μg/L respectively.

Of the 21 metals detected in the ground-water samples collected from Building 20 during the RI, 14 metals exceeded potential ARARs and/or background levels. Manganese and sodium were detected in all three monitoring wells; aluminum and iron were detected in wells B20MW-2 and B20MW-3; antimony and chromium were only detected in well B20MW-3; magnesium was detected in well B20MW-2; and, barium, calcium, potassium, strontium, and thallium were detected in well B20MW-1.

Petroleum hydrocarbons were detected in all three wells at the Building 20 AOC in 1994 for the RI. The highest concentrations of petroleum hydrocarbons was detected in well B20MW-3 at 0.13 mg/L and exceeded the potential ground-water ARAR of 0.1 mg/L.

4.3 SUMMARY OF NATURE AND EXTENT

This section summarizes the nature and extent of contamination in the subsurface soils and ground water at the Building 20 AOC during the RI.

Soils

Oil and grease, lead and zinc were detected in the soil samples collected during the 1986 investigation. The highest concentration of oil and grease was detected in the shallow soils in the northwest corner of the building.

Semi-volatiles and metals were detected in the soil samples collected for field screening for the RI in 1994. The semi-volatiles were detected in the shallow soils in the area adjacent to the sump (B20SB-5) located inside the northwest entrance to the building. The metals were detected in the deeper soils in the northwest corner of the floor drain (B20SB-2) and outside the northwest entrance to the building (B20SB-6).

Volatiles, semi-volatiles, pesticides/PCB compounds, and metals were detected in the confirmatory soil samples for the RI in 1994. The volatiles, none of which exceeded potential TBCs, were detected in the shallow soils in boring B20SB-5 and the deeper soils outside the north/northwest corner of the building (B20SB-4). The semi-volatiles detected above potential TBCs were detected in the shallow soils in boring B20SB-5. The metals detected above potential TBCs and/or background screening levels were detected in the shallow soils in boring B20SB-5 and the deeper soils in borings B20SB-2 and B20SB-4. The highest concentration of petroleum hydrocarbons was detected in boring B20SB-5. Based on the analytical results, as shown in Figure 4.2, the area adjacent to the sump in the northwest corner of the building appears to be an area of isolated soil contamination.

Ground Water

Oil and grease were detected in the grab ground water in the two easternmost borings drilled for the 1986 investigation. Metals were detected in all the grab ground-water samples collected at that time.

Metals, volatile organic compounds, semi-volatile organic compounds and glycols were detected in the ground water in well B20MW-1 (installed in 1986) during the quarterly sampling in 1992 and 1993. Glycols were detected above potential TBCs in the March and June 1993 sampling events, only.

No analytes were detected in the grab ground-water sample (B20HP-2) collected from the boring in the floor drain in 1994.

The semi-volatiles detected in the ground water in the monitoring wells above potential ARARs were reported in wells B20MW-2 and B20MW-3, outside the northeast entrance to the building, in 1994 and 1995. The metals detected above potential ARARs and/or background levels were reported in all three monitoring wells. Petroleum hydrocarbons above the potential ARARs were also detected in B20MW-3.

The semi-volatile contamination detected in the soil in 1994 is centered around the sump inside the building. Most of the semi-volatile contamination detected in the ground water in 1994 is in the well located outside the building downgradient of and closest to the sump.

5.0 CHEMICAL FATE AND TRANSPORT

This section discusses fate and transport mechanisms that may effect the analytes detected that exceeded potential ARARs or TBCs for the subsurface soils and ground water at Building 20.

Chemical persistence and potential routes of chemical migration are based primarily on the physical and chemical characteristics of individual analytes detected above potential ARARs and their degradation products, as well as site-specific geological, hydrological, and chemical conditions. As discussed in Section 3, the subsurface soils in the vicinity of Building 20 consist of fine to medium sand with silt and/or gravel. Due to the relatively impermeable nature of the underlying bedrock, ground-water flow and constituent migration should predominantly occur in the overlying unconsolidated glacial material. Physical and chemical properties for individual constituents are discussed in Volume 1 of this report. The following sections describe the analytes detected above potential ARARs or TBCs present at this location, and address potential migration routes for groups of theses analytes having generally similar transport characteristics.

5.1 METALS

Metals identified at this site as exceeding potential TBCs in subsurface soil are arsenic, calcium, chromium, silver and sodium. Arsenic was identified at 4.2 mg/kg, which exceeded the TBC of 3.3 mg/kg in one sample, B20SB-4, from the 4- to 6-foot depth of the northwest corner of the building. However, this concentration does not exceed the background screening concentration for arsenic of 4.9 mg/kg. Since the vertical and horizontal extent of arsenic contamination appears to be limited, arsenic presents a low potential for off-site migration. Calcium at levels above soil TBCs was found in 0- to 2-foot depth samples from soil boring B20SB-5 and in the 7- to 9-foot sample from soil boring B20SB-2. Calcium and sodium are some of the more soluble and thus more mobile metals in ground water. Solubility of calcium is strongly influenced by contact with carbon dioxide in the atmosphere or that produced by microbially-mediated reactions with soil organic matter. It may become solubilized in soils, precipitating later when separated from a reservoir of carbon dioxide, such as in ground water. Chromium solubility depends on the pH and the form of chromium (Table 4.2, Volume 1). Silver solubility is enhanced under conditions of high salinity. Silver and total chromium were detected at levels above potential soil TBCs in one sample from the 5- to 7-foot depth of boring B20SB-2. Due to the limited vertical and horizontal extent of contamination and the fact that concentrations were not much higher than background screening levels, neither of these metals were expected to result in adverse impacts in soil off-site.

Metals present in the soils tend to sorb to the soil and natural organics, and form metallic hydroxide precipitates. The lithology of the soil boreholes at the site indicates the presence of silty sands near ground surface and sand and fine to medium gravel from approximately from 5 to 20 feet bgs. Silty sands may sorb some metals and since the soils lack natural organics such as peat, the dominant form of metals should be metallic hydroxides. A variety of factors, including pH, determine whether or not these metals will be mobilized in soil. Most metals present in soils with a pH range of 5 to 8 will be present as insoluble metal hydroxides. The metals will remain in their predominantly insoluble form unless soil and/or ground-water conditions change. For acidic and basic solutions, the solubility of metal ions in solution increases significantly. Acidic soil conditions, as caused by acid rain, may promote the leaching of metals from the soil. The metals will return to insoluble hydroxides once the pH returns to more natural conditions. Under these conditions, metals are gradually transported downward through the soil to the ground water unless they sorb onto soil or the pH rises above 5. If the pH remains acidic, the metal species may then be transported with the water or undergo a series of ion exchange reactions with other compounds or elements.

Metals identified as exceeding potential ARARs in the ground water were aluminum, antimony, chromium, iron, manganese, sodium, and thallium. The potential for migration of these metals depends on the solubility of their various forms in ground water. Metals in solution will exist in an ionic form, ions in solution can precipitate and bind to soil and sediments. Metals in soluble form, and not bound to the soil, may be expected to migrate with ground water. All of the metals identified in ground water, with the exception of aluminum, iron, manganese and sodium, were found at levels only slightly higher than the potential ARARs. Aluminum, present under typical soil conditions as an insoluble hydroxide, can become more soluble through interaction with organic compounds in ground water. Once soluble aluminum migrates away from the influence of the organic compounds, it should precipitate out of solution in ground water. Iron also exists as insoluble iron oxides pH and redox conditions in typical soils. Manganese can be dissolved or insoluble depending on how much is present and soil conditions. Sodium is highly soluble and easily transported in ground water. Aluminum, iron, and manganese are common constituents of soil and might be associated with the presence of suspended particles in the samples. Although the concentrations of aluminum, iron, manganese, and sodium were detected above potential ARARs, they are not expected to result in adverse conditions in ground water. These metals are not likely to be transported great distances by ground water and through dispersion and diffusion the concentrations should drop below levels of concern if there is no further contribution from the source.

5.2 SEMI-VOLATILE ORGANIC COMPOUNDS

The following semi-volatile organic compounds were identified at concentrations exceeding potential TBCs in subsurface soil: benzo(a)anthracene, chrysene, fluoranthene, phenanthrene, and pyrene. Benzo(a) anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene were detected at concentrations exceeding potential ARARs in ground water.

Semi-volatile organics are expected to remain adsorbed to soil particles in unsaturated soils. In saturated soils, the soluble semi-volatile organics are available for transport with ground-water flow. At this site, the greatest concentration of the analytes exceeding potential TBCs were located in the 0- to 2-foot sample interval collected beneath concrete inside the building (B20SB-5). Semi-volatile organics were also detected in the 5- to 7-foot sample interval collected from two boring locations (B20SB-2 and B20SB-3). Since ground water at this site was encountered at depths ranging from 6.0 to 8.5 feet bgs, some of the soluble semi-volatile organics may be available for transport with the ground water while the insoluble organics remain suspended above the water table. Seasonal fluctuations in the water table may also spread organics not sorbed to soil particles vertically and horizontally.

Ground-water flow is normally linear with no vertical mixing by turbulence or convection as in surface water. As a result, the downward dispersion of soluble constituents is only by molecular diffusion and by downward displacement as new water enters at the water table (Farmer, 1983). Experiments have shown that some dissolved hydrocarbons may be adsorbed by some types of soil through which the ground water passes. Later, when weaker solutions of the dissolved components enter the same part of the soil formation, they may redissolve the adsorbed components. The net result of these processes is that hydrocarbons dissolved in ground water tend to travel at a slower rate than the water and persist longer in a given area.

The semi-volatile organics were identified in one monitoring well (B20MW-2) at levels slightly higher than potential ARARs. Monitoring well B20MW-2 was found to have several of the same semi-volatile organics as detected in B20SB-5. Since the well is located down gradient from this boring, the area around the sump and soil boring (B20SB-5) is the likely source of semi-volatile contamination.

Half-lives in soils for these PAHs range from 57 days for benzo(a)pyrene to nearly 6 years for benzo(k)fluoranthene. Due to slow degradation rates and slow travel to or release into ground water the PAHs are expected to persist in soils for relatively long periods of time. If the soils remain covered by the building, rain water will not percolate through these soils to cause further downward migration of PAHs. Half-lives of these PAHs in ground water are considerably longer than those for soils, ranging from 114 days for benzo(a)pyrene to nearly 12 years for benzo(k)fluoranthene. Given the presence of PAHs in the subsurface soils near ground water and the long half-lives in this medium, PAHs will probably remain at these levels in ground water for an extended period of time. Their migration in ground water, however, will be slow, presenting little opportunity for off-site migration.

Total recoverable petroleum hydrocarbons (TRPH) were detected in all four subsurface soil samples from Building 20 at concentrations ranging from 40 to 4400 mg/kg (Table 4.3). The highest value detected was in the 0- to 2-foot depth sample from B20SB-5, located near the former leaking floor drain and sump. Apart from this one sample, the concentration of TRPH appeared to be nearly uniform, ranging from 40 to about 62 mg/kg. TRPHs were also detected in all three ground-water samples with levels ranging between an estimated 0.09 to 0.13 mg/L. The highest level of TRPH detected in ground water exceeded the potential ground-water ARAR for petroleum hydrocarbons. The sample that exceeded the potential ARAR was from well B20MW-3, located near the southwest end of the building. The petroleum results were obtained through 418.1 methodology. Unlike other methodologies that are specific to petroleum hydrocarbons, natural products, like plant waxes, are sometimes measured as part of the TRPH. Also, the semi-volatile organic samples could have been measured as TRPH in this analytical procedure. As a result, the data might be biased high.

5.3 PESTICIDES/PCBs

PCB-1260 was detected in one subsurface soil sample from the 4- to 6-foot depth of soil boring B20SB-4. The level detected did not exceed potential soil TBCs. No PCBs were detected in ground water. Only one pesticide was detected at a level exceeding a TBC or ARAR, namely dieldrin in ground water. Dieldrin was detected at an estimated level of 0.005 mg/L from well B20MW-1. Dieldrin can undergo microbial degradation in ground water and tends to degrade faster under anaerobic conditions, having a half-life of several days to several years depending on the prevalence of anaerobic reactions. Dieldrin tends to sorb to soils, retarding its rate of migration in ground water. The limited detection of dieldrin coupled with its slow rate of movement in ground water suggest that the potential for off-site migration of pesticides from the Building 20 AOC is minimal.

6.0 BASELINE RISK ASSESSMENT

A baseline risk assessment was conducted for the Building 20 AOC to determine whether chemicals detected at the site pose a risk to human and/or ecological receptors. This assessment consisted of three components: (1) data evaluation, (2) human health risk assessment, and (3) ecological risk assessment. Analytical results collected at the AOC indicate that volatile organic compounds (volatiles); semi-volatile organic compounds (semi-volatiles), including polynuclear aromatic hydrocarbons (PAH); pesticides; polychlorinated biphenyls; inorganics; and petroleum hydrocarbons were detected in soil samples and ground-water samples collected from 6 borings and 3 monitoring wells at the site.

6.1 DATA EVALUATION

Analytical data for soil and ground-water samples collected from the Building 20 AOC were evaluated for use in the human health and ecological risk assessments, using the analytical data quality evaluation methodologies outlined in the risk assessment methodology presented in Volume 1 of this report. The soil and ground-water samples obtained during the RI were analyzed using EPA- and NYSDEC-approved methods. The appropriate and required data quality evaluation procedures were employed throughout the evaluation process. The laboratory QC procedures for calibration, method validation, and performance evaluation included such procedures as analysis of method blanks, matrix spike/matrix spike duplicate (MS/MSD) analyses, analysis of laboratory control samples, and assessment of surrogate analytes.

6.1.1 Analytical Methods and Quantitation Limits

The analytical data used for the risk assessment were obtained from EPA-approved methods incorporating additional QA procedures to meet the requirements for definitive data as listed in the Data Quality Objectives Process for Superfund (EPA, 1993a). According to EPA's Guidance for Data Usability in Risk Assessment (Part A) (EPA, 1992a), such data are appropriate for assessing risk as well as the nature and extent of site contamination.

The practical quantitation limit (PQL) is the lowest concentration that can be reliably assessed given the limits of precision and accuracy of routine laboratory operations and conditions. The PQL is generally five to ten times greater than the method detection limit. During the planning process for the RI, the PQLs were compared to chemical-specific potential ARARs and TBC criteria for soil and ground water to determine whether the analytical methods used were sensitive enough for regulatory review. These comparisons are presented in Appendix L of the RI Work Plan (LAW, 1993). The laboratory PQLs used for analysis of chemicals at the site were at or below the most stringent ARARs and/or TBCs except for a few chemicals analyzed by EPA Method 524.2 and 507 in aqueous media. Specifically, the PQLs for the analysis of acrylonitrile and 1,1,2,2-tetrachloroethane in ground water by EPA Method 524.2, exceeded the most stringent regulatory criteria identified (NYS Ground-Water Standards). The PQLs also exceeded the most stringent ARARs and/or TBCs for groundwater for EPA Method 507, used in the analysis of diazinon. These exceedances are due to the fact that available analytical methods are not sensitive enough to meet the most stringent regulatory criteria for compounds mentioned above.

The sample quantitation limit (SQL) is a sample-specific detection limit that accounts for sample characteristics, sample preparation, and analytical adjustments such as dilution. In general, the SQL's for samples analyzed from Building 20 were consistent with the PQLs established during the planning process.

6.1.2 Data Qualification

The data quality indicators which were evaluated during the data quality evaluation process included sample integrity, holding times, method blanks, internal standards, surrogate recoveries, MS/MSD recoveries, matrix spike blank recoveries, and duplicate precision. Analytical results associated with noncompliant QC indicators were assigned with the appropriate qualifiers. Based on the results of the data quality evaluation process, sample results were considered acceptable as presented, qualified as estimates ("J" flag), or rejected ("R" flag).

As a component of the data evaluation process, chemical concentrations in laboratory and field blanks were concentrations less than 10 times the amount measured in associated blanks, or if other "uncommon" laboratory contaminants were detected in samples at concentrations less than five times the amount reported in any associated blank, the results are flagged "U." Chemicals qualified in this manner are considered nondetect results. Duplicate samples (i.e., QC samples) collected at the Building 20 AOC were utilized in the risk assessment. They were not, however, considered as individual data points. Rather, the highest value in the sample or its duplicate was selected for calculations of exposure point concentrations. The results of the data quality evaluation process were summarized in the "RI Analytical Data Technical Memorandum No. 23" and the letter addendum dated June 1995 (LAW, 1995a; LAW, 1995b).

Positively detected data with no flags, non-detect data with "U" Flags, and estimated data with "J" flags were used in the risk assessment. However, rejected data with "R" flags and "U"-flagged data for chemicals that were not detected in at least one sample in a particular medium were not used in the risk assessment. In cases where the chemical was detected in at least one other sample, "U" qualified data were incorporated into the calculation of the exposure point concentration through use of one-half the SQL as a surrogate value for nondetect results.

6.1.3 Summary of Data Evaluation

The soil and monitoring well ground-water samples from the Building 20 AOC were collected and analyzed in accordance with EPA's Functional Guidelines (EPA, 1988 a,b; 1991) and EPA Region II data quality evaluation protocols (EPA, 1992 b,c). The analytical results which were considered acceptable as presented (no flags) and the estimated results ("J" flags) were considered acceptable for use in the baseline risk assessment. The "U"-flagged data were also considered acceptable for use in the baseline risk assessment if there was at least one positive detection of the chemical in a medium. The rejected analytical results ("R" flags) were not used in the baseline risk assessment. The analytical soil and ground-water data for the Building 20 AOC are presented in Appendix F (Tables F.1 through F.3) and the sampling locations are identified on Figures 2.1 and 2.2.

6.2 HUMAN HEALTH EVALUATION

The purpose of the human health evaluation was to establish whether contaminants present at the Building 20 AOC could pose a potential health risk to individuals under current and foreseeable future land uses in the absence of remediation. The human health evaluation consisted of the following components:

identification of chemicals of potential concern, exposure assessment, toxicity assessment, risk characterization, and uncertainty evaluation.

6.2.1 Identification of Chemicals of Potential Concern

The results of the data collection and data evaluation efforts are presented in this section. Based on the results of the data evaluation, a subset of chemicals present at the site were selected as chemicals of potential concern (COPCs) for the human health and ecological risk assessments. The COPCs at this AOC were identified in accordance with the general procedures for COPC selection presented in Volume 1 of the RI Report. The COPC selection is summarized in Tables 6.1 through 6.2.

Chemicals were not selected as COPCs if they were essential human nutrients (iron, magnesium, calcium, potassium, and sodium), or if the maximum sample concentration was less than the background screening concentrations (metals only). Chemicals detected in less than 5 percent of the total samples were also excluded from the risk assessment unless they were class A carcinogens. Total recoverable petroleum hydrocarbons (TRPH) were not selected as a COPC because of a lack of toxicity data for this mixture of chemicals and the uncertainties associated with the analytical method used (see Volume 1 for additional discussion). However, any of the individual constituents of TRPH detected at the site (e.g., benzene, toluene, xylenes, PAHs, etc.) were selected as COPCs and included in the quantitative risk evaluation.

Soil

For the purpose of evaluating exposures to soil, data collected from 0 to 9 feet bgs from six soil borings at the Building 20 AOC were evaluated. The utility and construction worker might be exposed to soil during utility installation/repair or construction/excavation activities at the Building 20 AOC. A total of 19 soil samples were collected for Level II field screening analysis. Based on the results of the field screening, a total of 4 soil samples were collected for confirmatory analysis from soil borings at the Building 20 AOC. The confirmatory results were used in the risk assessment because they met the requirements for definitive data.

All the available laboratory analytical data were used for the soil data set including the resample results. Therefore the number of valid analyses varies depending on the scope of the resampling and the number of rejected data points. Table 6.1 summarizes the chemicals detected in soils at the Building 20 AOC and the COPCs selected. A total of 36 COPCs were detected in soil including 5 volatiles, 18 semi-volatiles, 5 pesticides, PCB-1260, and 7 metals. Soil sampling locations with selected results are presented on Figure 4.2.

Ground Water

For the purpose of evaluating exposure to ground water, it is assumed that future industrial workers might be exposed to ground water at the site should groundwater be used as a potable water supply in the future. The monitoring well ground-water analytical data from the three wells sampled during the RI at Building 20 and the quarterly sampling data from B20MW-1 comprised the ground-water data set.

The valid laboratory analytical data obtained for ground-water samples from the three monitoring wells during the RI and the Quarterly sampling project were used to determine the presence or absence of chemicals which may pose a risk to human health. Table 6.2 summarizes the chemicals detected in the ground water and the COPCs selected. A total of 27 COPCs were detected in ground water including 6 volatiles, 17 semi-volatiles, 8 pesticides, and 12 metals. Ground water sampling locations with selected results are presented on Figure 4.3.

Summary

The COPCs selected for each media at the Building 20 AOC are as follows:

Parameter	Soil	Ground Water
VOLATILES:		
Acetone	X	X
Benzene	X	
Chloroform		X
Ethylbenzene	X	

Parameter	Soil	Ground Water
Methylene chloride		X
Naphthalene		X
Toluene	X	
1,1,1-Trichloroethane		X
Trichloroethene		X
Xylene (total)	X	
SEMI-VOLATILES:		
Acenaphthene	X	
Acenaphthylene	X	X
Anthracene	X	X
Benzo(a)anthracene	X	X
Benzo(a)pyrene	X	X
Benzo(b)fluoranthene	X	X
Benzo(g,h,i)perylene		X
Benzo(k)fluoranthene	X	X
Benzylbutylphthalate		X
bis(2-Ethylhexyl)adipate		X
bis(2-Ethylhexyl)phthalate	X	
Carbazole	X	
Chrysene	X	X
Dibenz(a,h)anthracene		X
Dibenzofuran	X	
Diethyl phthalate		X
Di-n-butyl phthalate		X
2,4-Dimethylphenol	X	
Fluoranthene	X	
Fluorene	X	X
Indeno(1,2,3-cd)pyrene		X
2-Methylnaphthalene	X	
Naphthalene	X	
Phenanthrene	X	X
Pyrene	X	X
METALS:		
Aluminum		X
Antimony		X
Arsenic		X
Barium		X
Chromium	X	
Chromium, hexavalent	X	
Chromium, total		X

Parameter	Soil	Ground Water
Cobalt	X	
Copper		X
Manganese		X
Molybdenum	X	
Nickel		X
Selenium	X	X
Silver	X	
Strontium	X	X
Thallium		X
Zinc		X
<u>**PESTICIDES/PCBs:**</u>		
Aldrin	X	
gamma-BHC	X	
Carbaryl		X
Chloroneb		X
Coumaphos		X
Dacthal (DCPA)		X
4,4'-DDD	X	
3,5-Dichlorobenzoic acid		X
Dieldrin		X
Endosulfan I		X
Heptachlor epoxide	X	
Mirex	X	
PCB-1260	X	
Trifluralin		X

6.2.2 Exposure Assessment

Under existing and proposed future land use scenarios for the Building 20 AOC, receptors may be at risk through potential exposure to chemicals detected in subsurface soil and ground water. The following sections describe present and potential future land uses at the Building 20 AOC, medium-specific exposure pathways, exposure point concentrations, and pathway-specific intakes for the COPCs. The exposure parameters and intake equations used for estimating risks through exposure pathways identified for this AOC are presented in Volume I. A subset of these exposure parameters was used for the Building 20 AOC and are presented in Appendix G.

6.2.2.1 Characterization of Exposure Setting

The physical characteristics of the site which may impact potential exposure include climate, vegetation, soil type, and hydrology. The hydrology, geology, stratigraphy, and hydrogeology of this AOC are discussed in Section 3.0 of this volume. The climate and vegetation are discussed in Volume 1.

6.2.2.2 Potentially Exposed Populations

The human populations residing at and/or working in the vicinity of the AOC are discussed in the following sections. Demographic information for Griffiss AFB and surrounding areas can be found in Volume 1.

AOC and Vicinity

Building 20, located in the south-central portion of Griffiss AFB, currently operates as a maintenance facility for locomotive engines, under an industrial land-use designation (see Figure 1.1). Following base realignment, it is assumed that land use of this AOC will remain industrial, and people will continue to work at this facility and the adjacent structure, located on the Lot 69 Hazardous Waste Storage Area. The primary source of contamination at Building 20 is a former leaking floor drain that allowed wastes generated during locomotive maintenance, including PCBs, oil, grease, and metals, to collect in and around the foundation of the building. The leak was discovered in 1985 with subsequent remediation of contaminated foundations and soils in 1987. Also, the Lot 69 AOC may have contributed to the ground-water contamination of the upgradient well due to the ground-water flow direction at the site.

Current Land Use

The Building 20 AOC is currently designated for industrial use, and individuals presently work in the locomotive engine maintenance facility. Exposure of site employees to constituents historically released from the leaking floor drain is limited due to the location of the spill area beneath the building foundation and pavement of the building floor with concrete. The possibility of exposure has been further diminished through the excavation of contaminated soils during remedial activities in 1987.

Future Land Use

According to the Griffiss Redevelopment Planning Council (GRPC) redevelopment scenario, future land-use maps indicate that land in the area of Building 20 will become commercial/administrative (GRPC, 1994; LAW, 1994). However, based on the site's proximity to area housing industrial operations (Lot 69 Hazardous Waste Storage Area and the base steam plant) and the uncertainty associated with future land use in this particular area, the risk assessment was conducted under the assumption that the site would retain its present industrial designation. Individuals employed in the future in Building 20 are not expected to be exposed to site chemicals for reasons previously mentioned under current land use.

The potentially exposed populations under these proposed future land use assumptions include utility, construction and industrial workers. The risks to utility and construction workers arising from potential exposure to contaminants detected in soils is of primary concern and will be addressed in the risk assessment. In addition, risks to industrial workers from exposure to ground water at the Building 20 AOC are evaluated. This is a hypothetical exposure scenario because it is highly improbable that ground water will be used for industrial purposes in the future due to the ready access to existing water supplies for the base and the City of Rome.

6.2.2.3 Identification of Exposure Pathways

Exposure pathways for this AOC are identified in the conceptual site model (CSM) presented in Figure 6.1. Exposure to residual contamination at this AOC may occur through several pathways. The media evaluated for potential impact on human health are soils and ground water.

Sources and Receiving Media

Waste fluids are known to have been released into a cavity beneath the floor of Building 20 from a leaking floor drain. During construction activities at the site in 1985, the foundation of Building 20 was penetrated and the accumulated liquid from the floor drain was released into the excavation. Remedial activities subsequently performed in 1987 included the excavation and removal of contaminated foundations and soils.

Fate and Transport in Release Media

The purpose of the fate and transport evaluation is to identify the possible extent and magnitude of environmental contamination and to identify potentially affected environmental media. One possible environmental transport pathway for chemicals detected at the site is through infiltration and percolation to deep soils and ground water. The soils at this site are generally composed of fine to medium sands with silt and gravel which would facilitate vertical percolation of COPCs to ground water. However, due to the concrete covering of former spill areas and the tendency of COPCs detected at the site to adsorb to soils, migration of site constituents is expected to be minimal.

Migration of contaminants from residual contaminated soils to ground water may constitute a continuing source of ground-water contamination at the site; however, low concentrations of volatile and semi-volatile organic compounds in site monitoring well samples indicate that such migration is not occurring to a great extent. Ground water could possibly discharge to surrounding surface-water bodies downgradient of the site. The nearest surface-water features to Building 20 include Threemile Creek and Rainbow Creek. The site is located approximately 1,450 feet west and upgradient of Rainbow Creek, which flows into Sixmile Creek, and 1,500 feet northeast of Threemile Creek. Contaminants detected in ground water at the site may possibly reach Threemile Creek but would not be expected to reach Rainbow Creek. The concentrations of contaminants in ground water at the point of discharge to surface waters may be diminished due to dilution, sorption and biodegradation.

6.2.2.4 Exposure Points and Exposure Routes

Because contaminants historically released from the Building 20 would likely impact soils and percolate to deep soil and ground water, persons who come into contact with these media are likely to be affected by site contaminants. Accordingly, occupational receptors, (including utility and construction workers), are the most probable target populations because their work may involve disturbance of site soil. These occupational workers could potentially be exposed to chemicals detected in soil at this site through incidental ingestion via hand-to-mouth activities, dermal absorption, and inhalation of fugitive dusts.

The hypothetical use of ground water as industrial process water or as a source of potable water for industrial workers was considered for this AOC in the event that future industrial use of this site will include use of ground water beneath the site as a water supply. Industrial workers could potentially be exposed to chemicals in ground water through ingestion, dermal contact, and inhalation of volatiles if ground water is used for process water.

6.2.2.5 Quantification of Exposure

Potential exposure is quantified by estimating exposure point concentrations and calculating pathway-specific intakes. Intake variables and exposure point concentrations are selected so that the combination of all variables results in an estimate of reasonable maximum exposure (RME) for each pathway. In the event that the RME exposure results in a hazard index greater than 1 or an excess cancer risk value greater than 1 x 10^{-4}, the risk is then quantified based on central tendency values as discussed in Volume 1, Section 5.1.7 of the RI Report.

Estimation of Exposure Point Concentrations

Sampling data collected from the Building 20 AOC varied in quantity by media. The maximum detected concentration of COPCs were used as the exposure point concentration for soil because the soil data set was limited to less than 10 samples, (i.e., the most for one analyte is 7 samples in the soil data set). The maximum detected concentration was determined for analytes detected in soil, and was used as the exposure point concentrations in evaluating potential risk to workers from exposure to soils at this AOC.

The maximum detected concentration for soil samples was used directly as the exposure point concentration for the dermal contact and incidental ingestion exposure pathways. For the inhalation of fugitive dust exposure pathway, ambient air concentrations were estimated using the maximum detected concentration, the Wind Erosion Model (Cowherd et al. 1985) and the Simple Box Model (Hwang and Falco 1986). These calculations are provided in Table G.7 of Appendix G. The contaminated area of the site was assumed to be 130.37 m^2 which is the approximate area encompassed by the soil samples taken at the site (i.e., a 38 foot square). A conservative assumption of no vegetative cover at the Building 20 was also made. Other site-specific parameters, including mean annual wind speed, threshold wind speed and length of the contaminated area perpendicular to the predominant wind direction, are listed in Table G.7. A more detailed discussion of the methods used in calculating exposure point concentrations is provided in Volume 1 of the RI Report.

The maximum detected concentration of COPCs were used as the exposure point concentration for ground water because the ground water data set was limited to less than 10 samples (i.e. the most for one analyte is 8 in the ground-water data set). The maximum ground-water concentrations were used directly as the exposure point concentration for the ingestion and dermal contact exposure pathways. For the inhalation of volatiles from industrial use of ground water (e.g., washing vehicles), ambient air concentrations were estimated using the maximum ground-water concentration and a conversion factor of $6.29 \times 10^{-3} L/m^3$. The conversion factor is based on the Simple Box Model and the conservative assumption that 100 percent of the volatiles in ground water will be released to the air (see Figure 5-10 from Volume 1 which is duplicated as Table G.11 in Appendix G). A more detailed discussion on the methods used in calculation of exposure point concentrations is provided in Volume 1 of the RI Report.

Pathway-Specific Intake Estimates

The values for each exposure parameter and the assumptions used in their derivation (e.g., frequency and duration of exposure), as well as intake values for each exposure pathway evaluated, are presented in Volume 1 as well as in Appendix G of this document. The pathway-specific intakes used are incorporated into Tables G.1 through G.10 which are presented in Appendix G.

Inhalation of Volatiles from Soil Exposure Estimates

Several volatile organic compounds were detected at low concentrations, (i.e., maximum concentrations of volatiles ranged from 0.003 mg/kg for benzene to 0.06 mg/kg for acetone) in soils at the Building 20 AOC. As explained in Section 5.1.5.2 of Volume 1, if no volatile organic constituent is detected at a concentration greater than the EPA's risk-based soil screening levels for transfers from soil to air at a particular AOC, then risk calculations were not performed for the inhalation of volatiles from soil pathway at that AOC. Exposure via inhalation to levels in soil below the risk-based soil screening levels for transfers from soil to air is not expected to result in an unacceptable risk. None of the volatile organic compounds detected in soils at the Building 20 AOC exceeded the EPA's soil screening levels for transfers from soil to air.

Dermal Contact Exposure Estimates

Dermal exposures to analytes in water and soil were adjusted to absorbed dose estimates using chemical-specific permeability constants (Kp values) and absorption coefficients, respectively. The permeability constants used to calculate absorbed dose(s) through dermal contact with contaminated ground water were obtained either from the EPA's guidance document Dermal Exposure Assessment: Principles and Applications or calculated using equations provided in this document (EPA, 1992d). The permeability constants, as well as the equations used in the derivation of those that were not available in the guidance document, are provided in Table 5.3a of Volume 1. The permeability coefficient (Kp values) for compounds detected in ground water at the Building 20 AOC are also provided in Table G.9 of Appendix G.

Dermal absorption factors for chemicals detected in soil at the Building 20 AOC are only available for PCB-1260. The EPA Region II does not recommend the use of surrogate values to calculate dermal absorption factors for soil. Accordingly, dermal exposure to chemicals in site soil are not evaluated quantitatively for PCB-1260 only, assuming absorption coefficients from soil through human skin of 6 percent (EPA, 1995b).

6.2.2.6 Summary of Exposure Assessment

Three potential exposure scenarios were quantified in this risk assessment for the Building 20 AOC. The scenarios quantified include:

1. Occupational Worker - Construction Worker (Future)

- Incidental ingestion of soil
- Inhalation of fugitive dust from soil
- Dermal contact with soil

2. Occupational Worker - Utility Worker (Current and Future)

- Incidental ingestion of soil
- Inhalation of fugitive dust from soil
- Dermal contact with soil

3. Occupational Worker - Industrial Worker (Future)

- Ingestion of ground water
- Dermal contact with ground water
- Inhalation of volatiles from ground water

The exposure pathways for each scenario were developed under the assumption that land use for this AOC will remain industrial following base realignment. The future industrial worker is included in the risk assessment to evaluate hypothetical future exposures to ground water. It is assumed that this individual works inside an industrial facility or shop and thus exposure to soil would be minimal, as compared to the other occupational receptors.

6.2.3 Toxicity Assessment

The toxicity assessment provides information regarding the potential for a specific chemical to cause adverse effects in humans and characterizes the relationship between the dose of a chemical and the incidence of adverse health effects in the exposed population. The systemic and carcinogenic effects of chemicals are evaluated based on reference doses (RfDs) and cancer slope factors. The following sections describe toxicity values used to evaluate potential risks from exposure to chemicals detected at the site.

6.2.3.1 Toxicity Values for Noncarcinogenic and Carcinogenic Effects

The EPA has developed toxicity values that reflect the magnitude of the adverse noncarcinogenic and carcinogenic effects from exposure to specific chemicals. The toxicity values for COPCs detected in site soil and ground water were obtained from the Integrated Risk Information System (IRIS, 1996). If the toxicity values were not provided in IRIS, secondary sources included the Health Effects Assessment Summary Tables for 1995 (HEAST, 1995) and the National Center for Environmental Assessment

(NCEA, 1996). Available toxicity values for COPCs detected at the site are incorporated into Tables G.1 through G.10 of Appendix G. Brief toxicological profiles for each COPC are provided in Volume 1. Toxicity values were not available for acenapthylene, benzo(g,h,i)perylene, phenanthrene, coumaphos, chloroneb, and 2-methylnaphthalene. The potential risks from exposure to these chemicals are evaluated qualitatively in Section 6.2.4.3.

Noncarcinogenic Effects

Chronic RfDs were used for the evaluation of noncarcinogenic effects because potential exposure is likely to occur over an extended period of time.

Carcinogenic Effects

Several constituents detected in soils or ground water at the Building 20 AOC are considered human carcinogens or potential suspected human carcinogens. Cancer slope factors were available for most of the carcinogenic COPCs detected. However, cancer slope factors were not available for PAHs detected at this site with the exception of benzo(a)pyrene. Accordingly, based on conversations with EPA Region II, a toxicity equivalency factor (TEF) methodology for calculating carcinogenic activity of PAHs based on each compound's potency relative to benzo(a)pyrene was used to develop cancer slope factors for these compounds (EPA, 1995b; EPA, 1993b). The TEF methodology is discussed in Volume 1.

6.2.3.2 Toxicity Assessment of Dermal Exposures

Currently, no RfDs or cancer slope factors are available for the dermal route of exposure. The oral RfDs and cancer slope factors may be adjusted by chemical-specific gastrointestinal absorption values, resulting in absorbed-dose RfDs or cancer slope factors (EPA, 1989b). Based on the recommendations of EPA Region II, the oral toxicity values (RfDs and cancer slope factors) were not adjusted because of lack of adequate data to determine gastrointestinal absorption (EPA, 1995b). Thus, the oral RfDs and cancer slope factors were used for quantitation of dermal exposure for all analytes (i.e., assuming 100 percent absorption from the gastrointestinal tract identified as COPCs for this site).

6.2.4 Risk Characterization

The risk characterization integrates the results of exposure and toxicity assessments into quantitative and qualitative expressions of risk associated with exposure to COPCs. Risks that a particular type of receptor (e.g., construction worker) might experience are determined by combining the relevant pathways with appropriate exposure factors into a risk scenario. Quantitative estimates of carcinogenic risk and noncarcinogenic benchmark values have been calculated for the Building 20 AOC. Risk estimates were calculated using the maximum detected concentrations of COPCs in soil, and the maximum detected concentrations of COPCs identified in ground water. Pathway risk estimates were summed by medium (e.g., soil exposures equal the sum of incidental ingestion, inhalation of fugitive dust, and dermal contact) to obtain the total risk from exposure by a given receptor. The chronic hazard index estimates and carcinogenic risks for the potentially exposed populations (i.e., utility, construction, and industrial workers) are presented in Appendix G, Tables G.1 through G.10.

6.2.4.1 Noncarcinogenic Health Effects Characterization

The benchmark level for evaluating noncarcinogenic effects, according to the EPA, is a hazard index (HI) of 1.0. A hazard index of 1.0 or less indicates that exposure to potential contaminants is not expected to result in adverse noncarcinogenic health effects. The potential noncarcinogenic health effects arising from exposure to soil and ground water at the Building 20 AOC are summarized below.

<u>Utility Workers</u>

The cumulative hazard index for utility workers exposed to soil at the Building 20 is 0.001 (Table 6.3). This cumulative hazard index is below the benchmark value of 1.0. Of the four potential exposure pathways, the greatest potential noncarcinogenic hazard (0.001) was from the incidental ingestion of soil (Tables G.1 through G.3). The calculated hazard index associated with dermal contact with soil was not quantified because the one compound for which a soil absorption coefficient was available, PCB-1260, does not have an RfD.

Construction Workers

The cumulative hazard index for construction workers exposed to subsurface soil at the Building 20 AOC is 0.05 (Table 6.4). This cumulative hazard index is below the benchmark value of 1.0. Of the four potential exposure pathways, the greatest potential noncarcinogenic hazard (0.05) was from the incidental ingestion of soil (Tables G.4 through G.6). The hazard index associated with exposure via dermal contact with soil was not quantified because the one compound for which a soil absorption coefficient was available, PCB-1260, does not have an RfD.

Industrial Workers

The cumulative hazard index for industrial workers exposed to ground-water was 2 (Table 6.5). This cumulative hazard index exceeds the benchmark value of 1.0. The calculated hazard indices for ingestion of ground water, dermal exposure to ground water, and inhalation of volatiles released from ground water were 2, 0.01, and 0.000002, respectively (Tables G.8 through G.10). Thallium, manganese, antimony, and arsenic were the greatest contributors to the calculated hazard index for the ingestion of groundwater with hazard quotients of 0.6, 0.3, 0.3, and 0.3, respectively. The maximum detected concentrations of thallium and arsenic were found in B20MW-1, the highest concentration for manganese was found in B20MW-2, and the highest for antimony was found in B20MW-3. None of the four contributors to the hazard index of 2 have the same target organ. Thus, the hazard index separated by target organ does not exceed the benchmark value of 1.0.

6.2.4.2 Carcinogenic Risk

The National Contingency Plan (NCP) defines the target risk range for exposure to carcinogenic compounds as an excess upper bound lifetime risk within the range 10^{-4} to 10^{-6}. This translates to one excess cancer in a population of ten thousand to one excess cancer in a population of one million. Potential risks from exposure to carcinogens at the Building 20 AOC were evaluated for utility, construction, and industrial workers. The potential carcinogenic risks from exposure to soil and ground water at the Building 20 AOC are summarized below.

It is important to note that the cancer risk estimates quantified in the risk assessment are upper bound estimates. That is, a cancer risk of 2 x 10^{-4} means that if 1,000,000 people were exposed to site-related contaminants, most likely fewer than 200 people might be expected to develop cancer as a specific consequence of the exposure.

Utility Workers

The cumulative carcinogenic risk associated with exposure by utility workers to subsurface soil is 1 x 10^{-6} (Table 6.3). Therefore, the carcinogenic risk from exposure to contaminants in soil by utility workers is at the low end of EPA's target risk range. The pathway-specific risks for utility workers from incidental ingestion of soil, inhalation of fugitive dust, and dermal contact were 1 x 10^{-6}, 3 x 10^{-10}, and 5 x 10^{-9}, respectively (Tables G.1 through G.3). The chemical contributing most to the estimated cancer risks for this exposure scenario is benzo(a)anthracene which was detected in 1 of 4 soil samples. Risk from dermal contact with soils was only quantified for PCB-1260 due to the lack of absorption coefficients for other COPCs detected at the site.

Construction Workers

The cumulative carcinogenic risk associated with exposure by utility workers to soil is 2 x 10^{-6} (Table 6.4). Therefore, the carcinogenic risk from exposure to contaminants in soil by construction workers is at the low end of EPA's target risk range. The pathway-specific risks for construction workers from incidental ingestion of soil, inhalation of fugitive dust, and dermal contact were 2 x 10^{-6}, 8 x 10^{-11}, and 1 x 10^{-9}, respectively (Tables G.4 through G.6). The chemical contributing most to the estimated cancer risks is benzo(a)anthracene which was detected in 1 of 4 soil samples. As mentioned previously, cancer risk due to dermal contact was only quantified for PCB-1260 because absorption coefficients were not available for other COPCs at the site.

Industrial Workers

The cumulative carcinogenic risk from exposure to contaminants in ground water by industrial workers is 1 x 10^{-4} (Table 6.5). Therefore, the carcinogenic risk from exposure to contaminants in ground water by industrial workers is within the EPA's target risk range. The pathway-specific risks from ingestion, inhalation of volatiles released from ground water and dermal exposure to ground water were 5×10^{-5}, 4×10^{-9} and 6×10^{-5}, respectively (Tables G.8 through G.10). Arsenic was the greatest risk contributor for ingestion of groundwater at 5×10^{-5} and benzo(a)pyrene was the greatest risk contributor for dermal contact with groundwater at 4×10^{-5}. The maximum concentrations of arsenic and benzo(a)pyrene were detected in B20MW-1 and B20MW-2, respectively. Other COPCs contributing risk greater than 1×10^{-6} for ingestion and/or dermal contact were benzo(a)anthracene, benzo(b)fluoranthene, dibenz(a,h)anthracene and, indeno(1,2,3-cd)pyrene.

6.2.4.3 Qualitative Evaluation of Risk

Toxicity values were not available for 2-methylnaphthalene, acenaphthylene, benzo(g,h,i)perylene, phenanthrene, coumaphos, and chloroneb, and, therefore, quantitative evaluation of the potential risk arising from exposure to these compounds was not assessed for the Building 20 AOC. Thus, the compounds are discussed qualitatively below using data from all of the soil and ground-water samples collected at the Building 20 AOC.

2-Methylnaphthalene was detected in 1 of 4 soil samples collected from this AOC at a concentration of 29 mg/kg. 2-Methylnaphthalene does not have an ARAR or TBC for soil at Griffiss AFB. 2-Methylnaphthalene is reported to only cause minor skin irritation and skin photosensitization (HSDB, 1996).

Acenaphthylene was detected at a concentration of 1.7 mg/kg in 1 of 4 soil samples collected at this AOC. The most stringent potential ARAR or TBC available for acenaphthylene in soil at Griffiss AFB is 41 mg/kg; thus, the concentration at the site does not exceed the potential TBC. Acenaphthylene was also detected at 0.00006 mg/L in 1 of 8 ground-water samples at this AOC. No potential ARAR or TBC is available for acenaphthylene in ground water at Griffiss AFB. Exposure to high-risk polycyclic aromatic hydrocarbons (PAHs) by skin and lung absorption results in increased incidences of skin and lung cancer, but purified forms of PAHs administered to rhesus monkeys have not been successful in developing tumors (HSDB, 1996). Thus, exposure to site concentrations of acenaphthylene is not expected to cause adverse health effects.

Benzo(g,h,i)perylene was detected at concentrations ranging from 0.00009 mg/L to 0.0002 mg/L in 2 of 4 ground-water samples at this AOC. No potential ARAR or TBC is available for benzo(g,h,i)perylene in ground water at Griffiss AFB. Benzo(g,h,i)perylene is reported to cause lung tumors in rats, but there is no evidence that this compound may induce cancer in humans (IRIS, 1996).

Phenanthrene was detected at concentrations ranging from 0.13 mg/kg to 75 mg/kg in 3 of 4 soil samples collected at this AOC. Only one sample had phenanthrene at a concentration that exceeded the most stringent ARAR or TBC for soil (50 mg/kg) that corresponds to the recommended NYS Soil Cleanup Objectives (see Table 4.3). Phenanthrene was also detected in ground water at concentrations ranging from 0.00003 mg/L to 0.0002 mg/L detected in 2 of 8 ground-water samples. This concentration is below the most stringent ARAR or TBC for ground water of 0.050 mg/L. Phenanthrene is reported to cause lung tumors in rats, but there is no evidence that this compound may induce cancer in humans (IRIS, 1996).

Coumaphos was detected in 1 ground-water sample at a detected concentration of 0.0002 mg/L. The most stringent ARAR or TBC for coumaphos is 0.005 mg/L (Table 4.6); thus, the concentration at the site is below the ARAR or TBC. Toxicity studies indicated that weekly dipping in a solution of 200 ppm of coumaphos for a 2 year period had no adverse effect on cattle (HSDB, 1996).

Chloroneb was detected in 1 ground-water sample from this AOC at a concentration of 0.000045 mg/L. No potential ARAR or TBC is available for chloroneb in ground water. Chloroneb has an oral LD_{50} greater than 11,000 ppm for rats and an LD_{low} of greater than 5,000 ppm (HSDB, 1996). Thus, the concentration of chloroneb at the site is not expected to cause an adverse health effect in humans.

Based on the results of soil and ground-water investigations at the Building 20 AOC, possible exposure to the concentrations of 2-methylnaphthalene, acenaphthylene, benzo(g,h,i)perylene, phenanthrene, coumaphos and chloroneb in these media is unlikely to pose a health hazard from possible exposure of occupational receptors potentially performing intrusive activities at this site.

6.2.5 Uncertainties Evaluation

Uncertainty exists in many areas of the human health assessment. However, use of conservative variables in intake calculations and conservative assumptions throughout the risk assessment results in an assessment that is protective of human health. A summary of uncertainties in the risk assessment process is included in Table 6.6. A detailed discussion of the uncertainties inherent in the risk assessment process is provided in Volume 1. The site-specific uncertainties for the baseline risk assessment for the Building 20 AOC are identified below.

Uncertainties Associated with Exposure Assessment

- The hazard indices associated with dermal contact with soil were not quantified due to the lack of dermal absorption factors necessary for evaluating absorption of chemicals from soil across the human skin barrier. This may lead to underestimation of the overall risk due to dermal contact with detected chemicals.

- In quantifying exposure, it was assumed that chemicals are uniformly distributed over a defined area. At this AOC, chemical samples were collected from the suspected source(s) of contamination. Areas thought to be free of contamination were not investigated. Data collected in this manner, rather than through random sampling, result in a biased data set which may overestimate risk.

- Exposure point concentrations in air were derived using two EPA-approved models: the Wind Erosion Model and the Simple Box Model. As discussed in Section 5.1 of Volume 1 of the RI Report, the inherent assumptions and input parameters used in these models are likely to overestimate exposure point concentrations and, ultimately, the calculated risk through the inhalation pathway.

- It was assumed that construction may occur on the site over a one-year period. Because of the size of the AOC, construction may require less time to complete. Also, it was assumed that construction and utility workers come into contact with soil. The use of protective clothing would greatly decrease the exposure predicted for this site. These assumptions may overestimate risk.

- The highest concentrations of benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene were rejected from sample B20SB-5b and not used in the risk assessment. This may cause an underestimation of overall risk.

- The risk assessment for this site was quantified based on analysis of a relatively small number of soil samples. The limited amount of soil and ground-water data collected contributes uncertainty to risks calculated for soil pathways.

- The risk assessment was performed based on an assumed industrial scenario for this AOC. Potential future changes in the land use designation for this site may significantly impact the results of risk assessment.

- It was assumed that ground water would be used for industrial purposes in the future. This is very unlikely since the site has ready access to the existing water supplies at the base and in the City of Rome which are more than adequate for industrial purposes.

Uncertainties Associated with Toxicity Assessment

- Inhalation RfDs and cancer slope factors were unavailable for many chemicals detected in site soils and ground water. The risks of potential exposure to compounds of unknown toxicity could not be quantified. This may result in underestimation of the overall risk.

- Detected concentrations of benzo(a)anthracene were partially responsible for risk estimates which fell within the EPA cancer target level in the risk assessment. Analytical results for this compound in sample B20SB-5b were rejected and could not be used in the risk assessment. Because this particular sample contained significantly elevated concentrations of semi-volatile organic compounds relative to other samples collected at the AOC, it is likely that the true semi-volatile maximum concentrations are greater than those used in the estimation of risk. Therefore, carcinogenic risks via the ingestion of soil pathway may be underestimated.

- The cancer slope factors for PAHs were calculated based on their toxicity relative to benzo(a)pyrene. Therefore, calculated risks from oral exposure to soil may be underestimated or overestimated.

- Toxicity values were not available for several COPCs at this site, including acenaphthylene, benzo(g,h,i)perylene, phenanthrene, 2-methylnaphthalene, coumaphos, and chloroneb.

- Risk to construction workers from exposure to soils were quantified using chronic health values. Because the assumed exposure duration is only one year, subchronic health values could have been used instead. Accordingly, the calculated risks from exposure to soil contaminants may be overestimated.

While some of the uncertainties identified above may underestimate the potential risks from exposure to soils and ground water at the Building 20 AOC, overall the use of conservative assumptions throughout the risk assessment results in an assessment that is protective of human health.

6.2.6 Summary of the Baseline Risk Assessment

The analytical data used in the risk assessment were acquired and evaluated according to approved EPA procedures. The data were deemed suitable for the needs of the risk assessment. The risk assessment was performed on soil and ground-water data collected from 6 soil borings and 3 monitoring wells advanced at the Building 20 AOC.

According to the Griffiss Redevelopment Planning Council, the current industrial use of land at this AOC is expected to remain unchanged following base realignment. The exposure pathways and exposed populations were chosen for quantification of exposure based on assumed current and future industrial land use at the Building 20 AOC. Occupational receptors (utility and construction workers) were identified as populations potentially exposed to soils. Potential exposure pathways identified for soils included incidental ingestion of soil, dermal contact with soils, and inhalation of fugitive dust. In addition, potential exposure to ground water by future industrial workers was also evaluated. Potential exposure pathways identified for ground water included ingestion, dermal contact, and inhalation of volatiles released from ground water. The cumulative carcinogenic risks associated with the utility and construction worker exposure scenarios were 1×10^{-6} and 2×10^{-6} respectively, which are within EPA's target risk range. Benzo(a)anthracene in soil was the major risk contributor for the utility and construction workers. The cumulative RME carcinogenic risks for the industrial worker exposure scenario was 1×10^{-4}, which is within the EPA's target risk range.

The cumulative noncarcinogenic hazard indices for all soil exposure pathways for the two types of workers were below the benchmark level of 1.0. With the exception of ingestion, all noncarcinogenic pathways for the groundwater exposure pathways were below the benchmark level of 1.0. The groundwater ingestion pathway exceeded the benchmark level of 1.0 for future industrial workers with a hazard index of 2. The chemicals contributing the majority of the risk were thallium, manganese, arsenic, and antimony. It is important to note that the hazard index for these COPCs separated by target organ does not exceed the benchmark level of 1.0 for any organ.

The primary objective of the RI for the Building 20 AOC was to confirm the cleanup of contaminated soils at the site and evaluate whether residual contamination exists in soils and ground water at the site. To meet this objective, soil samples were collected in the area of the former investigation and cleanup, starting at a depth of 4 feet. The highest concentrations of volatile and semi-volatile organic compounds were detected in sample B20SB-5b, collected at a depth of 0 to 2 feet. This information indicates that the detected concentrations do not represent residual contamination from the floor drain, but may be present due to another source such as the adjacent sump.

The results of the human health baseline risk assessment indicate that chemicals detected in soil should not present a risk to current and future occupational workers. Exposure of industrial workers to groundwater yielded a cumulative hazard index above EPA's benchmark value and an excess cancer risk that is within the EPA's target risk range. However, it is important to note that the hazard index split out by target organ does not exceed EPA's benchmark level. The quantitative evaluation of risk is subject to several conservative assumptions and should not be considered as an absolute quantitative measure of risk.

6.3 ENVIRONMENTAL EVALUATION

This section evaluates the potential for adverse impacts to ecological receptors at the Building 20 AOC. The methodology for this evaluation is presented in Volume 1 of the RI.

6.3.1 Identification of Chemicals of Potential Concern

Soil samples were obtained from the Building 20 AOC as part of the RI. However, these samples were only collected from subsurface soils (greater than 2 feet bgs). Because ecological receptors are not expected to be found at these depths, and disposal practices make it unlikely that surface soil would be contaminated, no soil COPCs were identified.

Neither surface-water bodies nor sediments are associated with this AOC and, therefore, COPCs were not identified and no environmental assessment was conducted for these media at the Building 20 AOC.

6.3.2 Exposure Assessment

Building 20 AOC is located in a highly developed portion of the base, with little habitat available for ecological receptors. Contamination that may be associated with the site is expected to be well below ground surface, beneath the building. In addition, future land use is expected to remain industrial. Therefore, potential exposures related to this AOC are not considered to exist for ecological receptors.

6.3.2.1 Threatened or Endangered Species

There are no plant or animal species at the base or in the immediate vicinity of the base that are considered to be threatened or endangered, according to the U.S. Department of the Interior (50 CFR 17). Though some plant species present at the base are protected in the state of New York, these species have not been found in this portion of the base. Therefore, threatened and/or endangered species are not considered to be a concern at this AOC.

6.3.2.2 Exposure Pathways

No complete exposure pathways for ecological receptors can reasonably be expected to exist for this AOC.

6.3.5 Conclusions, Limitations, and Uncertainties

Risks to ecological receptors due to COPCs at this AOC are considered to be insignificant because complete exposure pathways do not exist. If it were discovered that surface soil surrounding the Building 20 AOC was contaminated, further evaluation might be warranted.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The purpose of this section of the RI report is to briefly summarize the site background, scope of the field investigation, site characteristics, nature and extent of contamination, and baseline risk assessment, and to provide recommendations as to whether no further action, removal action(s), feasibility study, or additional field investigation is needed at the Building 20 Locomotive Roundhouse AOC.

7.1 SUMMARY AND CONCLUSIONS

Site Background

- A new steam entrance into Building 20 was to be constructed in 1985 at approximately 5 feet below grade at the northwest corner of the building. A free-flowing oily liquid was encountered upon penetration of the foundation, and approximately 150 to 200 gallons of liquid entered the excavation. It was determined that the source of contamination was a leaking floor drain located in the northern portion of the building. All recoverable liquid and contaminated soil, concrete, and debris encountered were containerized at that time. Analysis of the excavated material indicated 109 parts per million (ppm) PCBs, 700 ppm lead and 446,000 ppm oil and grease.

- Hydro-Environmental Technologies, Inc., (HET) drilled five soil borings inside the building, near the leaking floor drain, collected grab ground-water samples from each boring and installed one monitoring well outside the building in 1986. Oil and grease were detected in all the soil borings, metals were detected in the soil borings at the northwest corner of the building and PCBs were not detected in any of the borings. 1,1,1-Trichloroethane was detected in the grab ground-water sample collected from soil boring B5, located near the sump in the northwest corner of the building. The monitoring well (B20MW-1) was not sampled at that time.

- Well B20MW-1 was sampled as part of the quarterly sampling project conducted in 1992 and 1993. Acetone, chloromethane, methylene chloride, and diethylphthalate were the only volatile and semi-volatile compounds detected. Barium, chromium, manganese, nickel, and zinc were also detected. Pesticides and cyanide were not detected in any of the quarterly sampling events. Glycols were detected during two of the four quarterly sampling events.

Scope of Field Investigations

- Three soil borings were drilled to ground water inside the building, one upgradient and two downgradient of the leaking floor drain. Soil samples were collected at 2-foot intervals for field screening by the on-site laboratory.

- Three additional soil borings were drilled at locations based on the field screening results of the subsurface soil samples collected from the three initial borings. Soil samples were collected at 2-foot intervals for field screening by the on-site laboratory.

- A grab ground-water sample was collected from one soil boring (B20SB-2) for field screening by the on-site laboratory.

- Four confirmatory soil samples were collected from the soil borings, based on field screening results, and submitted to the off-site laboratory for analysis.

- Two monitoring wells were installed on May 27, 1994, at preselected locations. Soil samples were collected at 2-foot intervals for geotechnical analysis.

- The two newly installed monitoring wells and one existing well were sampled and the ground-water samples were submitted to the off-site laboratory for analysis.

Site Characteristics

- Building 20 is located in the central industrial portion of the base in an area with approximately 2 to 3 feet of topographic relief. The site is located west of the Lot 69 AOC and northwest of the Coal Storage Yard AOC. Approximately 98 percent of the site is occupied by the building, 1 percent of the site is covered by asphalt and 1 percent of the site is grassed.

- Surface-water run-off from the western portion of the site is channeled into the base storm drain system which discharges to Threemile Creek and the run-off from the eastern portion of the site is channeled into the base storm drain system which discharges to Sixmile Creek. Threemile Creek is located approximately 1,450 feet west of the site and Sixmile Creek is located 1,500 feet northeast of the site.

- Soils at the site are described as fine to medium sand with silt and gravel from the soil surface beneath the concrete and asphalt to 2 feet bgs and fine sand with varying quantities of silt and gravel from 2 feet bgs to depths ranging from 7 to 20 feet bgs.

- The saturated zone was encountered in the soil borings at depths ranging from 4 to 8.5 feet bgs. Static ground-water levels measured in the monitoring wells ranged from 7.38 to 9.48 feet below the top of the well casing. The depth to ground water is shallower in the southern portion of the site and slightly deeper in the northern portion of the site.

- The ground-water flow direction at Building 20 is to the west-southwest towards Threemile Creek. The hydraulic conductivities for the newly installed wells, based on slug test results, ranged from 0.013 ft/min in well B20MW-2 to 0.039 ft/min in well B20MW-3.

Nature and Extent of Contamination

- The field screening results indicated no volatiles, semi-volatiles or pesticide/PCB compounds were detected at concentrations above potential ARARs. The only semi-volatiles detected (fluoranthene and pyrene) were in the shallow soil sample from soil boring B20SB-5, located at the northwest end of the site, near the sump. Seven metals were detected in the field screening of the subsurface samples. Calcium, cobalt, and zinc were the only metals detected at concentrations above TBC criteria.

- Five volatile organic compounds and six pesticides were detected at concentrations below potential TBCs in the confirmatory subsurface soil samples in the borings at the site. A total of 18 semi-volatiles were detected in the subsurface soil samples and the concentrations of benzo(a)anthracene, chrysene, fluoranthene, phenanthrene and pyrene exceeded potential TBCs in the shallow soil sample from boring B20SB-5. Of the 26 metals detected in the subsurface soils, the concentrations of arsenic, calcium, total chromium, silver, and sodium were above the potential TBCs.

- No volatiles, semi-volatiles, pesticide/PCB compounds or metals were detected in the field screening results of the grab ground-water samples collected from boring B20SB-2.

- No volatiles were detected in the ground water at concentrations above potential ARARs. Dieldrin was detected at concentration above the potential ARAR in one sample. A total of 17 semi-volatiles were detected in the ground water, six of which were detected at concentrations above potential ARARs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene. Of the 21 metals detected in the ground water, aluminum, antimony, calcium, chromium, iron, manganese, sodium and thallium were the metals detected at concentrations above potential ARARs.

- Total recoverable petroleum hydrocarbons concentration exceeded a potential ARAR at monitoring well B20MW-3.

Baseline Risk Assessment

- Future land use maps indicate the land in the area of Building 20 will become commercial/administrative. However, based on the site's proximity to area housing industrial operations (Lot 69 Hazardous Waste Storage Area and the base steam plant) and the uncertainty associated with future land use in this particular area, the risk assessment was conducted under the assumption that the site would remain under the present industrial designation.

- The human health risk assessment evaluated exposure to occupational receptors including utility workers (subsurface soils), construction workers (subsurface soils) and industrial workers (ground water). The routes of exposure to site subsurface soils include incidental ingestion, inhalation of fugitive dusts and dermal absorption. The routes of potential exposure to ground water include ingestion, dermal contact and inhalation of volatile organic compounds.

- Soil exposures were evaluated based on the results of the subsurface soil samples collected from this investigation and ground-water exposures were evaluated based on the results of the ground-water samples collected from the three monitoring wells at the site.

- None of the exposure pathways indicated an unacceptable risk from exposure to the contaminants detected in the soils. The cumulative hazard indices ranged from 0.001 to 0.05, which were below the benchmark value of 1.0. The cancer risk estimates were 1×10^{-6} and 2×10^{-6}, which are within EPA's risk range.

- The hazard index for industrial workers exposed to ground water was 2, which is above the benchmark value of 1.0. The chemicals contributing to this hazard index each affect a different target organ; none of the target organ-specific hazard indices exceed the benchmark level of 1.0.

  The estimated cancer risk was 1×10^{-4}, which is within the EPA's cancer risk range. Arsenic and benzo(a)pyrene contributed the most to the cancer risk.

- Risks to ecological receptors due to contamination at this AOC have not been quantitatively assessed since no complete exposure pathways exist. The ecological risks associate with the Building 20 AOC are, therefore, considered to be virtually nonexistent.

7.2 RECOMMENDATIONS

- Although there are no unacceptable human and ecological risks associated with the contamination detected at the site, the concentrations of the analytes detected indicates there is still contaminated soils beneath the concrete floor in the northwest corner of Building 20 adjacent to the sump.

- The greatest number of analytes and the highest concentrations of these analytes, were detected in the soil boring drilled downgradient of the leaking floor drain and adjacent to the sump near the northwest entrance to the building. This indicates the sump may be the source of contamination.

- The USAF is proceeding with an Interim Removal Action for this site followed by confirmatory sampling. Removal of the source area (e.g., contaminated soils) should mitigate any residual ground-water contamination at the site.

8.0 REFERENCES

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TAB

Tables

Table 1.1: 1986 Post-Remediation Analytical Results for Soil and Ground-Water Samples
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample ID	Depth Sampled (ft.)	Oil and Grease (ppm)	Cadmium (ppm)	Chromium (ppm)	Lead (ppm)	Mercury (ppm)	Nickel (ppm)	Silver (ppm)	Zinc (ppm)	PCB (ppm)	1,1,1-Trichloroethane (ppm)
Grab Ground Water											
B1		<2	0.83	1.26	3.31	<0.03	1.77	0.09	5.98	<0.001	<0.001
B2		<2	<0.04	<0.05	0.12	<0.03	0.12	<0.02	0.35	<0.001	<0.001
B3		4	0.13	0.36	1.28	<0.03	0.60	0.02	5.46	<0.001	<0.001
B4		5	0.47	0.88	2.33	<0.03	1.20	0.04	7.33	<0.001	<0.001
B5		<2	<0.47	<0.05	<0.10	<0.03	0.05	<0.02	0.06	<0.001	0.003
Monitoring Well Ground Water B20MW-1 was not sampled.											
Soil Boring Soils*											
B1-S1	0 to 2	65	<0.04	<0.05	<0.10	<0.30	<0.05	<0.02	0.08	<0.1	<0.01
B1-S2	2 to 4	10	<0.04	<0.05	<0.10	<0.30	<0.05	<0.02	0.07	<0.1	<0.01
B1-S3	4 to 6	11	<0.04	<0.05	<0.10	<0.30	<0.05	<0.02	<0.01	<0.1	<0.01
B1-S4	6 to 8	4	<0.04	<0.05	<0.10	<0.30	<0.05	<0.02	0.05	<0.1	<0.01
B2-S1	0 to 2	13	<0.04	<0.05	<0.10	<0.30	<0.05	<0.02	0.05	<0.1	<0.01
B2-S2	2 to 4	8	<0.04	<0.05	<0.10	<0.30	<0.05	<0.02	0.03	<0.1	<0.01
B2-S3	4 to [illegible]	3	<0.04	<0.05	<0.10	<0.30	<0.05	<0.02	0.03	<0.1	<0.01
B2-S4	6 to 8	10	<0.04	<0.05	<0.10	<0.30	<0.05	<0.02	0.07	<0.1	<0.01
B3-S1	0 to 2	22	<0.04	<0.05	<0.10	<0.30	<0.05	<0.02	0.03	<0.1	<0.01
B3-S2	2 to 4	19	<0.04	<0.05	<0.10	<0.30	<0.05	<0.02	0.03	<0.1	<0.01
B3-S3	4 to 6	7	<0.04	<0.05	<0.10	<0.30	<0.05	<0.02	0.04	<0.1	<0.01
B3-S4	6 to 8	15	<0.04	<0.05	<0.10	<0.30	<0.05	<0.02	0.09	<0.1	<0.01
B4-S1	0 to 2	<1	<0.04	<0.05	<0.10	<0.30	<0.05	<0.02	0.03	<0.1	<0.01
B4-S2	2 to 4	6	<0.04	<0.05	<0.10	<0.30	<0.05	<0.02	0.03	<0.1	<0.01
B4-S3	4 to 6	3	<0.04	<0.05	<0.10	<0.30	<0.05	<0.02	0.02	<0.1	<0.01
B4-S4	6 to 8	50	<0.04	<0.05	0.13	<0.30	<0.05	<0.02	0.08	<0.1	<0.01
B5-S1	0 to 2	11	<0.04	<0.05	<0.10	<0.30	<0.05	<0.02	0.03	<0.1	<0.01
B5-S2	2 to 4	3	<0.04	<0.05	0.14	<0.30	<0.05	<0.02	0.06	<0.1	<0.01
B5-S3	4 to 6	2	<0.04	<0.05	0.13	<0.30	<0.05	<0.02	0.08	<0.1	<0.01
B5-S4	6 to 8	3	<0.04	<0.05	<0.10	<0.30	<0.05	<0.02	0.07	<0.1	<0.01

Notes:
ft. = feet below surface grade
ppm = parts per million

* = Extraction Procedure Toxicity (EPTOX) test was employed for metals analysis. Results represent EPTOX extract concentration, not total concentrations.
PCBs = Polychlorinated biphenyl compounds
< = Less than indicated detection limit

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PREPARED/DATE: DSS 6/25/95
CHECKED/DATE: LAS 8/4/95

Table 1.2: Detection of Analytes in Ground Water
Quarterly Sampling Data from 1992 to 1993
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

PARAMETERS	November 1992	March 1993	June 1993	September 1993
Metals (mg/L)				
Barium	0.06	0.051	0.044	ND
Calcium	121	94.0	119	ND
Chromium, Total	ND	0.023	ND	ND
Iron	0.235	0.31	0.508	ND
Magnesium	8.0	9.19	7.13	ND
Manganese	0.113	ND	ND	ND
Nickel	ND	0.276	0.271	ND
Potassium	73	38.6	51.5	ND
Sodium	249	258 JH	168	ND
Zinc	0.22	0.100	0.248	ND
Volatile Organics (µg/L)				
Acetone	1.7	3.0 J	ND	ND
Chloromethane	1.9	ND	ND	ND
Methylene Chloride	15	1.5 J	ND	13 JT
Semi-Volatile Organics (µg/L)				
Diethylphthalate	2.7	ND	ND	ND
Total Glycol (mg/L)	ND	0.06 J	0.10 J	ND

J = Estimated quantitation level based upon QC data
JH = Estimated quantitation, possibly biased high based on QC data
JT = Estimated quantitation, possibly high or false positive based on trip blank data
ND = Not Detected

PREPARED/DATE: DSS 6/25/95
CHECKED/DATE: LAS 8/4/95

Table 2.1: Chemical Samples Collected[a]
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Matrix	Samples Collected	Date Collected	Laboratory	Field Screening	TCL VOA	TCL BNA	TAL Inorganics and Cr^{+6}	Organo-phosphorus Pesticides	NC Pesticides	TCL PCBs	Organo-Chlorine Herbicides	Total Glycols	TRPH
Grab Ground Water	B20HP-2	06/20/94	MEA	1	0	0	0	0	0	0	0	0	0
Ground Water	B20MW-1	08/07/94	L, CTM	0	1	1	1	1	1	1	0	1	1
		04/04/95[b]	L	0	0	1	1 (c)	0	1	0	1	0	0
	B20MW-2	08/08/94	L, CTM	0	1	1	1	1	1	1	0	1	1
		04/04/95[b]	L	0	0	1	1 (e)	0	1	0	1	0	0
	B20MW-3	08/07/94	L, CTM	0	1	1	1	1	1	1	1	1	1
		04/04/95	L	0	0	1	0	0	0	0	0	0	0
	B20MW-3-MS/MD	08/07/94	L, CTM	0	2	2	2	2	2	2	0	2	2
	B20MW-2-MS/MD	04/04/95	L	0	0	2	2	0	2	0	0	0	0
	B20MW-2-01	08/08/94	L, CTM	0	1	1	1	1	1	1	0	1	1
		04/04/95	L	0	1	1	1 (c)	0	1	0	1	0	0
	TB1-080794	08/07/94	L	0	1	0	0	0	0	0	0	0	0
	TB2-080894	08/08/94	L, CTM	0	1	0	0	0	0	0	0	1	0
Soil	B20SB-1b	06/20/94	MEA	1	0	0	0	0	0	0	0	0	0
	B20SB-1c	06/20/94	MEA	1	0	0	0	0	0	0	0	0	0
	B20SB-1d	06/20/94	MEA, R	1	1	1	1	0	0	1	0	0	1
	B20SB-2b	06/20/94	MEA	1	0	0	0	0	0	0	0	0	0
	B20SB-2c	06/20/94	MEA	1	0	0	0	0	0	0	0	0	0
	B20SB-2d	06/20/94	MEA, R	1	1	1	1 (c)	0	0	1	0	0	1
	B20SB-2e	06/20/94	MEA, R	1	0	0	1 (d)	0	0	0	0	0	0
	B20SB-3b	06/20/94	MEA	1	0	0	0	0	0	0	0	0	0
	B20SB-3c	06/20/94	MEA	1	0	0	0	0	0	0	0	0	0
	B20SB-3d	06/20/94	MEA, R	1	0	0	1 (d)	0	0	0	0	0	0
	B20SB-4b	07/06/94	MEA	1	0	0	0	0	0	0	0	0	0
	B20SB-4c	07/06/94	MEA	1	0	0	0	0	0	0	0	0	0
	B20SB-4d	07/06/94	MEA, R	1	0	0	1 (d)	0	0	0	0	0	0
		11/16/94	L	0	1	1	1 (c)	0	0	1	0	0	1
	B20SB-5b	07/06/94	MEA, R	1	0	0	1 (d)	0	0	0	0	0	0
		11/16/94	L	0	1	1	1 (c)	0	0	1	0	0	1
	B20SB-5c	07/06/94	MEA	1	0	0	0	0	0	0	0	0	0
	B20SB-5d	07/06/94	MEA	1	0	0	0	0	0	0	0	0	0
	B20SB-5e	07/06/94	MEA, R	1	0	0	1 (d)	0	0	0	0	0	0
	B20SB-6b	07/06/94	MEA, R	1	0	0	1 (d)	0	0	0	0	0	0
	B20SB-6c	07/06/94	MEA	1	0	0	0	0	0	0	0	0	0
	B20SB-2d-MS/MD	06/20/94	R	0	2	2	2	0	0	2	0	0	2
	B20SB-2e-MS/MD	06/20/94	R	0	0	0	2	0	0	0	0	0	0
	B20SB-1d01	06/20/94	R	0	1	1	1	0	0	1	0	0	1

R = RECRA Environmental, Inc.
L = Lancaster Laboratories, Inc.
CTM = CTM Analytical Laboratories, Inc. (glycol analysis only)
MEA = MEA, Inc. (on-site mobile laboratory)

(a) Analytical methods for each matrix are presented in Table 2.2.
(b) Sample analyzed for 407, 408, 632 and total cyanide only.
(c) Not analyzed for hexavalent chromium.
(d) Analyzed for hexavalent chromium only.
(e) Analyzed for cyanide

ICP = Inductively Coupled Plasma
VOA = Volatile Organic Analyte
BNA = Base-Neutral/Acid Extractable
TAL = Target Analyte List
TCL = Target Compound List
TRPH = Total Recoverable Petroleum Hydrocarbons
PCBs = Polychlorinated Biphenyls
NC Pesticides = Nonconventional Pesticides

PREPARED/DATE: DSS 6/25/95
CHECKED/DATE: LAS 7/4/95

Table 2.2: Analytical Parameters and Methods
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

PARAMETER	METHODS	
	SOIL	WATER
FIELD SCREENING:		
Metals	ICP Modified 6010	–
TCL Organics:		
Volatiles	SW5030/8010 SW5030/8020	SW5030/8010 SW5030/8020
Semi-Volatiles	SW3550/8040 SW3550/8100	SW3510/8040 SW3510/8100
TCL PCBs:	SW3550/8080	SW3510/8080
OFF-SITE LABORATORY ANALYSIS:		
TCL Organics:		
Volatiles	SW5030/8240	EPA 524.2
Semi-Volatiles	SW3550/8270	EPA 525.1
TAL Inorganics:		
Metals by ICP	SW3050/6010	SW3005/6010
Metals by GFAA		
Antimony	SW3050/6010	SW3005/7041
Arsenic	SW3050/7060	SW3020/7060
Lead	SW3050/6010	SW3020/7421
Molybdenum	SW3050/7480	SW3005/6010
Selenium	SW3050/7740	SW3020/7740
Strontium	SW3050/7780	SW3005/6010
Thallium	SW3050/7841	SW3020/7841
Mercury by CVAA	SW7471	SW7470
Cyanide	SW9010, 9012	SW9012
Hexavalent Chromium:	7195	7196
Pesticides/PCBs	SW3550/8080	SW3510/8080
Herbicides	–	EPA 515.1
Organophosphorus Pesticides	–	SW3510/8140
NC Pesticides	–	various as indicated below
TRPH:	EPA418.1	EPA418.1
Total Glycols:	–	NYSDOH-APC44

TCL = Target Compound List
TAL = Target Analyte List
PCBs = Polychlorinated Biphenyls
ICP = Inductively coupled argon plasma
NC Pesticides = Non-Conventional Pesticides
CVAA = Cold Vapor Atomic Absorption
TRPH = Total Recoverable Petroleum Hydrocarbons
XRF = X-ray fluorescence spectroscopy
SW = SW-846

NC Pesticide Methods:
EPA 507 EPA 547
EPA 549 EPA 531.1
EPA 504 EPA 632
EPA 548 EPA 508

PREPARED/DATE: DSS 6/25/95
CHECKED/DATE: LAS 8/4/95

Table 3.1: Summary of Soil Properties
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Boring No.	Depth Interval (Feet bgs)	Field Description	Geotechnical (USCS) Classification and Description
B20SB-1	1 to 7	Silty fine to coarse SAND with gravel	Not Analyzed
B20SB-2	0.5 to 4	Silty SAND and GRAVEL	Not Analyzed
	5.5 to 9	Silty fine to medium SAND with gravel	
B20SB-3	1 to 8	Silty fine SAND with gravel	Not Analyzed
B20SB-4	0 to 2	Sandy SILT with gravel and clay	Not Analyzed
	2 to 2.75	Silty fine to medium SAND	
	2.75 to 4.0	Sandy SILT with clay	
	4 to 4.6	Silty fine to medium SAND	
	4.6 to 5.5	Fine sandy SILT with clay	
	5.5 to 8	Silty fine to medium SAND with gravel and clay	
B20SB-5	0.5 to 2.5	Fine sandy SILT with gravel	Not Analyzed
	2.5 to 4.35	Fine sandy SILT	
	4.35 to 4.5	Silty fine to medium SAND	
	4.5 to 5	Fine sandy SILT	
	5 to 6.5	Silty fine to medium SAND	
	6.5 to 8.5	Silty fine to medium SAND with gravel	
B20SB-6	4.75 to 6.50	Fine sandy SILT	Not Analyzed
	6.50 to 6.85	Silty fine to medium SAND	
	6.85 to 8.75	Silty fine to medium SAND with gravel	
B20MW-2	2 to 4	Silty fine SAND with gravel	Sandy SILT (ML)
	15 to 17	Fine to coarse SAND with gravel	Poorly graded SAND with gravel (SP)
B20MW-3	6 to 8	Silty fine SAND with gravel	Poorly graded GRAVEL with silt and sand (GP-GM)
	15 to 17	Silty fine to medium SAND with gravel	Poorly graded SAND with gravel (SP)

PREPARED/DATE: DSS 6/25/95
CHECKED/DATE: LAS 7/4/95

Table 4.1: Detection of Analytes in Soil Samples – Level II Field Screening
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample I.D.	Depth Interval ft. bgs	Fluoranthene µg/kg	Pyrene µg/kg	Aluminum mg/kg	Calcium mg/kg	Cobalt mg/kg	Iron mg/kg	Magnesium mg/kg	Manganese mg/kg	Silicon mg/kg	Zinc mg/kg
B20-SB1B	1 – 2	330U	330U	7,079	3,811	ND	12,216	2,366 J	449	ND	ND
B20-SB1C	3 – 5	330U	330U	5,357	54,443	ND	9,300 J	3,519 J	286	ND	ND
B20-SB1D	5 – 7	330U	330U	3,719	1,012 J	ND	11,544	1,569 J	359	ND	ND
B20-SB2B	0 – 2	330U	330U	1,391	185,275	ND	2,509 J	5,577	119	ND	ND
B20-SB2C	2 – 4	330U	330U	2,361	198,017	ND	3,990 J	6,565	133	ND	ND
B20-SB2D	5 – 7	330U	330U	3,695	134,199	104	9,310 J	5,351	238	ND	ND
B20-SB2E	7 – 9	330U	330U	5,280	20,457	ND	9,878 J	3,148 J	792	ND	ND
B20-SB3B	0 – 2	330U	330U	6,563	98,705	ND	16,118	5,155	324	ND	ND
B20-SB3C	2 – 4	330U	330U	5,471	1,755	ND	10,583 J	1,944 J	422	ND	ND
B20-SB3D	4 – 6	330U	330U	5,949	1,459 J	ND	10,764 J	1,861 J	382	ND	ND
B20-SB3E	6 – 8	330U	330U	--	--	--	--	--	--	--	--
B20-SB4B	0 – 2	330U	330U	4,478	2,908 J	ND	10,698 J	1,438 J	430	ND	ND
B20-SB4C	2 – 4	330U	330U	4,253	443	ND	7,564 J	1,118 J	74	ND	ND
B20-SB4D	4 – 6	330U	330U	2,760	951 J	ND	6,159 J	1,034 J	135	133 J	ND
B20-SB5B	0.5 – 2.5	2,020	2,696	5,526	1,551	ND	12,984	1,908 J	944	ND	ND
B20-SB5C	2.5 – 4.5	330U	330U	2,469	285 J	ND	4,964 J	780 J	176	ND	ND
B20-SB5D	4.5 – 6.5	330U	330U	4,582	300 J	ND	11,174	1,789 J	400	ND	ND
B20-SB5E	6.5 – 8.5	330U	330U	3,195	669 J	ND	9,567 J	1,515 J	615	ND	ND
B20-SB6B	4.8 – 6.8	330U	330U	4,443	415 J	ND	9,267 J	1,408 J	378	ND	ND
B20-SB6C	6.8 – 8.8	330U	330U	4,019	46,813	ND	38,769	2,847 J	562	904 J	451 J

Level II field screening performed by MEA, Inc.
ft. bgs = feet below ground surface
µg/kg = micrograms per kilogram, dry weight basis
mg/kg = milligrams per kilogram, dryweight basis
J = Estimated concentration
U = Not detected, below method quantification limit
ND = Analyte not detected
-- Analyte not analyzed

PREPARED/DATE: KLA 7/10/95
CHECKED/DATE: DSS 7/24/95

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2588-0211.21F

Table 4.2: Detection of Analytes in Subsurface Soil Samples
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample I.D.	B20SB-1D	(1) B20SB-1D 01	B20SB-2D	B-20SB-2E	B-20SB-3D	B20SB-4D	B20SB-4D	B20SB-5B	B20SB-5B	B20SB-5E	B20SB-6B
Sample Date	06-20-94	06-20-94	06-20-94	06-20-94	06-20-94	07-06-94	11-16-94	07-06-94	11-16-94	07-06-94	07-06-94
Sample Depth	(5-7')	(5-7')	(5-7')	(7-9')	(4-6')	(4-6')	(4-6')	(.5-2.5')	(0-2')	(6.5-8.5')	(4.75-6.75')
METHOD: SW-846 8240											
VOLATILES: (µg/kg)											
Acetone	12 U	12 U	11 U	--	--	--	4 J	--	60	--	--
Benzene	6 U	6 U	6 UJ	--	--	--	6 U	--	3 J	--	--
Ethylbenzene	6 U	6 U	6 U	--	--	--	6 U	--	10	--	--
Toluene	6 U	6 U	8 U	--	--	--	2 J	--	8	--	--
Xylenes, Total	6 U	6 U	6 U	--	--	--	6 U	--	56	--	--
METHOD: SW-846 8270											
SEMI-VOLATILES: (µg/kg)											
2,4-Dimethylphenol	380 U	370 U	480 U	--	--	--	390 U	--	130 J	--	--
2-Methylnaphthalene	380 U	370 U	480 U	--	--	--	390 U	--	29000	--	--
Acenaphthene	380 U	11 J	480 U	--	--	--	390 U	--	10000	--	--
Acenaphthylene	380 U	370 U	480 U	--	--	--	390 U	--	1700	--	--
Anthracene	380 U	30 J	480 U	--	--	--	390 U	--	9700	--	--
benzo (a) anthracene	380 U	370 U	480 U	--	--	--	390 U	--	31000 J	--	--
benzo (a) pyrene	380 U	52 J	480 U	--	--	--	390 U	--	25000 R	--	--
benzo (b) fluoranthene	36 J	67 J	36 J	--	--	--	390 U	--	30000 R	--	--
benzo (k) fluoranthene	380 U	36 J	480 U	--	--	--	390 U	--	8900 R	--	--
bis(2-ethylhexyl)phthalate	35 J	80 J	39 J	--	--	--	190 J	--	130 J	--	--
Carbazole	--	--	--	--	--	--	390 U	--	4500	--	--
Chrysene	380 U	370 U	480 U	--	--	--	390 U	--	38000 J	--	--
Dibenzofuran	380 U	370 U	480 U	--	--	--	390 U	--	5000	--	--
Fluoranthene	380 U	130 J	480 U	--	--	--	390 U	--	55000	--	--
Fluorene	380 U	370 U	480 U	--	--	--	390 U	--	28000	--	--
Naphthalene	380 U	370 U	480 U	--	--	--	390 U	--	11000	--	--
Phenanthrene	380 U	150 J	130 J	--	--	--	390 U	--	75000	--	--
Pyrene	380 U	100 J	480 U	--	--	--	390 U	--	73000 J	--	--
METHOD: SW-846 8080											
PESTICIDES/PCB COMPOUNDS: (µg/kg)											
4,4'-DDD	3.9 U	3.7 U	4.8 U	--	--	--	3.9 U	--	9.9 J	--	--
Aldrin	2 U	1.9 U	2.5 U	--	--	--	2 U	--	7.2 J	--	--
Gamma BHC - Lindane	--	--	--	--	--	--	0.13 J	--	19 UJ	--	--
Heptachlor Epoxide	2 U	1.9 U	2.5 U	--	--	--	2 U	--	5.3 J	--	--
Mirex	0.95 J	1.9 U	2.5 U	--	--	--	--	--	--	--	--
PCB-1260	39 U	37 U	48 U	--	--	--	6.4 J	--	370 U	--	--
METALS: (mg/kg)											
Aluminum (3050/6010)	8090	11200	5720	--	--	--	9440	--	8220	--	--
Arsenic (3050/7060)	2.6	2.9	2.8 J	--	--	--	4.2	--	2.7	--	--
Barium (3050/6010)	38.8	62.2	68	--	--	--	37	--	41	--	--
Beryllium (3050/6010)	0.35 U	0.34 U	0.32 U	--	--	--	0.471 J	--	0.419 J	--	--
Calcium (3050/6010)	6390	4220	74800	--	--	--	1950	--	54300	--	--
Chromium (3050/6010)	9.2	11.5	27.7 J	--	--	--	9.8	--	15.3	--	--
Cobalt (3050/6010)	5.2	4.8	19.4	--	--	--	5.9	--	5.46 J	--	--
Copper (3050/6010)	8.4 J	1.6 J	9.9	--	--	--	21.7	--	24.2	--	--
Hexavalent Chromium (7195)	0.41	0.21 U	--	0.5	0.22 U	0.39	--	0.58	--	0.23 U	0.22 U
Iron (3050/6010)	15500	16000	17900	--	--	--	18200	--	17300	--	--
Lead (3050/6010)	10.7	12.6	10	--	--	--	6	--	27	--	--
Magnesium (3050/6010)	2570	2380	3980	--	--	--	3070	--	3170	--	--
Manganese (3050/6010)	415	394	723 J	--	--	--	696	--	491	--	--
Mercury (7471)	0.1 U	0.11 U	0.1 U	--	--	--	0.032 J	--	0.041 J	--	--
Molybdenum (3050/7480)	5.8 U	5.6 U	6.4	--	--	--	5.9 U	--	5.6 U	--	--
Nickel (3050/6010)	11.6	11.9	41.6 J	--	--	--	12.8	--	20.6	--	--
Potassium (3050/6010)	883	754	886	--	--	--	921	--	740	--	--
Selenium (3050/7740)	0.36 U	0.35 U	0.31 U	--	--	--	0.76 J	--	1.11 J	--	--

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Table 4.2: Detection of Analytes in Subsurface Soil Samples
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample I.D.	B20SB-1D	(1) B20SB-1D 01	B20SB-2D	B-20SB-2E	B-20SB-3D	B20SB-4D	B20SB-4D	B20SB-5B	B20SB-5B	B20SB-5E	B20SB-6B
Sample Date Sample Depth	06-20-94 (5-7')	06-20-94 (5-7')	06-20-94 (5-7')	06-20-94 (7-9')	06-20-94 (4-6')	07-06-94 (4-6')	11-16-94 (4-6')	07-06-94 (.5-2.5')	11-16-94 (0-2')	07-06-94 (6.5-8.5')	07-06-94 (4.75-6.75')
Silver (3050/6010)	1.2 U	1.1 U	6.4 J	--	--	--	0.61 J	--	2.2 U	--	--
Sodium (3050/6010)	163	196	248	--	--	--	68 U	--	598	--	--
Strontium (3050/7780)	12.6	10.8	112	--	--	--	6.55	--	66.7	--	--
Vanadium (3050/6010)	15.8	21.2	12.6	--	--	--	17.1	--	29.7	--	--
Zinc (3050/6010)	35.8	37	35.3	--	--	--	52	--	48	--	--
WET CHEMISTRY: (mg/kg)											
% Moisture (160.3)	16.3	14.2	6.8	12	11.5	16.7	14.8	10.1	11	16.1	12.4
Petroleum Hydrocarbons (418.1)	39.8	50.9	61.7	--	--	--	40	--	4400	--	--

(1) = Duplicate of B20SB-1D

Note: Results reported on a dry weight basis
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
J = Estimated
R = Rejected
U = Analyte not detected
UJ = Estimated concentration possibly biased low
-- = Analyte not analyzed

PREPARED/DATE: CLC 7/25/95
CHECKED/DATE: DSS 8/2/95

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Table 4.3: Frequency of Detection and Exceedance of Potential TBCs for Subsurface Soil Samples
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

			Comparison to ARARs and TBCs		Comparison to Background	
Parameter	Frequency of Detection	Range of Detected Concentrations	Frequency of Detection Above Most Stringent	Most Stringent Criterion	Frequency of Detection Above Background	Background Screening Concentration
Volatiles (µg/kg)						
Acetone	2/4	4 J – 60	0	200	--	NA
Benzene	1/4	3 J	0	60	--	NA
Ethylbenzene	1/4	10	0	5500	--	NA
Toluene	2/4	2 J – 8	0	1500	--	NA
Xylenes, total	1/4	56	0	1200	--	NA
Semi-Volatiles (µg/kg)						
2,4-Dimethylphenol	1/4	130 J	0	41000000	--	NA
2-Methylnaphthalene	1/4	29000	--	NA	--	NA
Acenaphthene	2/4	11 J – 10000	0	50000	--	NA
Acenaphthylene	1/4	1700	0	41000	--	NA
Anthracene	2/4	30 J – 9700	0	50000	--	NA
Benzo (a) anthracene	1/4	31000 J	1	224	--	NA
Benzo (a) pyrene	1/3	52	0	61	--	NA
Benzo (h) fluoranthene	2/3	36 J – 67 J	0	1100	--	NA
Benzo (k) fluoranthene	1/3	36 J	0	1100	--	NA
Bis (2-ethylhexyl) phthalate	4/4	39 J – 190 J	0	50000	--	NA
Carbazole	1/2	4500	0	290000	--	NA
Chrysene	1/4	38000 J	1	400	--	NA
Dibenzofuran	1/4	5000	0	6200	--	NA
Fluoranthene	2/4	130 J – 55000 J	1	50000	--	NA
Fluorene	1/4	28000	0	50000	--	NA
Naphthalene	1/4	11000	0	13000	--	NA
Phenanthrene	3/4	130 J – 75000	1	50000	--	NA
Pyrene	2/4	100 J – 73000 J	1	50000	--	NA
Pestides/PCB Compounds (µg/kg)						
Aldrin	1/4	7.2 J	0	41	--	NA
Gamma-BHC (Lindane)	1/2	0.13 J	0	6	--	NA
Heptachlor epoxide	1/4	5.3 J	0	20	--	NA
Mirex	1/2	0.95 J	0	3200	--	NA
PCB-1260 (Arochlor 1260)	1/4	6.4 J	0	90	--	NA
4,4'-DDD	1/4	9.9 J	0	2900	--	NA
Metals (mg/kg)						
Aluminum	4/4	5720 – 11200	0	18306	0	18306
Arsenic	4/4	2.7 – 4.2	1	3.3	0	4.9
Barium	4/4	37 – 68	0	300	0	71
Beryllium	2/4	0.419 J – 0.471 J	0	0.64	0	0.64
Calcium	4/4	1950 – 74800	2	23820	2	23820
Chromium, hexavalent	4/7	0.39 – 0.58	0	400	2	0.45
Chromium, total	4/4	9.8 – 27.7 J	1	22.6	1	22.6
Cobalt	4/4	5.2 – 19.4	0	30	1	19.3
Copper	4/4	8.4 J – 24.2	0	43	0	43
Iron	4/4	16000 – 18200	0	47350	0	47350
Lead	4/4	6 – 27	0	36.2	0	36.2
Magnesium	4/4	2570 – 3980	0	7175	0	7175
Manganese	4/4	415 – 723	0	2106	0	2106
Mercury	2/4	0.032 J – 0.041 J	0	0.1	0	0.1 U
Molybdenum	1/4	6.4	0	10000	1	6 U
Nickel	4/4	11.9 – 41.6 J	0	46.1	0	46.1
Potassium	4/4	740 – 921	0	1993	0	1993
Selenium	2/4	0.76 J – 1.11 J	0	2	2	0.34 U
Silver	2/4	0.61 J – 6.4 J	1	2.2	1	1.1 U
Sodium	3/4	196 – 598	1	259	1	259
Strontium	4/4	6.55 – 112	--	NA	2	54.7
Vanadium	4/4	12.6 – 29.7	0	150	0	35.8
Zinc	4/4	35.3 – 52	0	120	0	120
Wet Chemistry (mg/kg)						
Moisture, percent	10/10	6.8 – 16.7	--	NA	--	NA
Petroleum Hydrocarbons	4/4	40 – 4400	--	NA	--	NA

NA – Not Applicable
J – Estimated Value
µg/kg – micrograms per kilogram, dry weight based
mg/kg – milligrams per kilogram, dry weight based
U – Analyte not detected at the indicated detection limit

PREPARED/DATE: DSS 7/25/95
CHECKED/DATE: LAS 8/4/95

Table 4.4: Detection of Analytes in Ground–Water Samples
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample I.D.	B20MW–1	B20MW–2	(1) B20MW–01	B20MW–3
Sample Date	08–07–94	08–08–94	08–08–94	08–07–94
METHOD: EPA 524.2				
VOLATILES: (µg/L)				
1,1,1–Trichloroethane	0.5 U	0.8	0.8	1.4
Chloroform	0.2 U	0.4	0.3	0.3
Naphthalene	0.5 U	3.7 U	3.4	0.5 U
Trichloroethene	0.5 U	0.5 U	0.5 U	0.4 J
METHOD EPA 525.1				
SEMI–VOLATILES: (µg/L)				
Acenaphthylene	0.5 UR	0.06 J	0.04 J	0.5 UR
Anthracene	0.5 UR	0.06 J	0.2 J	0.5 UR
Benzo(a)anthracene	0.1 UR	0.2 J	0.2 J	0.07 R
Benzo(a)pyrene	0.2 UR	0.2 J	0.1 J	0.05 R
Benzo(b)fluoranthene	0.2 UR	0.2 J	0.2 J	0.1 R
Benzo(g,h,i)perylene	0.5 UR	0.09 J	0.05 J	0.5 UR
Benzo(k)fluoranthene	0.2 UR	0.09 J	0.2 UJ	0.2 UR
bis(2–Ethylhexyl)adipate	2 UR	2 J	2 UJ	2 UR
Chrysene	0.2 UR	0.3 J	0.2 J	0.09 R
Di–n–butylphthalate	0.03 R	0.08 J	0.07 J	0.5 R
Fluorene	0.5 UR	1 J	1 J	0.5 UR
Indeno(1,2,3–cd)pyrene	0.4 UR	0.09 J	0.06 J	0.4 UR
Phenanthrene	0.5 UR	2 J	3 J	0.04 R
Pyrene	0.5 UR	0.7 J	1 J	0.2 R
METHOD: SW–846 8080, 8140; EPA 531.1, 547, 548, 632				
PESTICIDES/PCB COMPOUNDS: (µg/L)				
Carbaryl	0.3 J	4 U	4 U	4 U
Coumaphos	––	––	––	0.2 J
METHOD: EPA 504, 507, 508, 515.1				
PESTICIDES/PCB COMPOUNDS: (µg/L)				
Chloroneb	––	0.044 J	0.045 J	1 U
Endosulfan I	––	0.001 J	0.001 J	0.1 U
Trifluralin	––	0.006 J	0.06 U	0.06 UJ
METALS: (mg/L)				
Aluminum (3005/6010)	0.2 U	0.66	0.181 J	0.98 J
Antimony (3005/7041)	0.003 U	0.003 U	0.003 U	0.0142 J
Arsenic (3020/7060)	0.0098	0.00384 J	0.00463 J	0.00389 J
Barium (3005/6010)	0.063	0.027	0.024	0.024
Calcium (3005/6010)	106	75.7	75	56.7
Chromium (3005/6010)	0.0142 J	0.02 U	0.02 U	0.114 J
Copper (3005/6010)	0.01 U	0.004 J	0.01 U	0.01
Hexavalent Chromium (7196)	0.02 U	0.02 U	0.002 J	0.02 U
Iron (3005/6010)	0.088 J	1.34	0.41	2.65 J
Lead (3020/7421)	0.0075 U	0.00099 J	0.0006 J	0.00119 J
Magnesium (3005/6010)	5.58	15.5 J	15 J	12
Manganese (3005/6010)	0.088	0.816	0.759	0.562 J
Molybdenum (3005/6010)	0.006 J	0.0045 J	0.02 U	0.0107 J
Nickel (3005/6010)	0.0144 J	0.04 U	0.04 U	0.073
Potassium (3005/6010)	35.4	1.99	1.82	1.98
Selenium (3020/7740)	0.00075 J	0.00037 J	0.00077 J	0.0012
Sodium (3005/6010)	384	36.8	36.7	52.5
Strontium (3005/6010)	0.394	0.184	0.186	0.116
Thallium (3020/7841)	0.005 J	0.00045 J	0.00045 J	0.002 U
Vanadium (3005/6010)	0.015 U	0.0045 J	0.015 U	0.0039 J
Zinc (3005/6010)	0.0084 J	0.0061 J	0.0063 J	0.0161 J
WET CHEMISTRY: (mg/L)				
Petroleum Hydrocarbons (418.1)	0.09 J	0.2 U	0.09 J	0.13 J

(1) = Duplicate of B20MW–2

µg/L = micrograms per liter
mg/L = milligrams per liter
J = Estimated
R = Rejected
U = Analyte not detected
UJ = Estimated concentration possilby biased low
–– = Analyte not analyzed

PREPARED/DATE: CLC 7/25/95
CHECKED/DATE: DSS 8/2/95

Table 4.5: Detection of Analytes in Ground-Water Samples – Spring 1995
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample I.D.	B20MW-1	B20MW-2	(1) B20MW-2-01	B20MW-3
Sample Date	04-04-95	04-04-95	04-04-95	04-04-95
METHOD: EPA 525.1				
SEMI-VOLATILES: (µg/L)				
Anthracene	0.5 U	0.04 J	0.5 U	0.5 U
Benzo(a)anthracene	0.1 U	0.3 J	0.1 J	0.1 U
Benzo(a)pyrene	0.2 U	0.2 J	0.09 J	0.2 U
Benzo(b)fluoranthene	0.2 U	0.4 J	0.1 J	0.2 U
Benzo(g,h,i)perylene	0.5 U	0.2 J	0.06 J	0.5 U
Benzo(k)fluoranthene	0.2 U	0.08 J	0.04 J	0.2 U
bis(2-Ethylhexyl)adipate	2 U	2 U	0.09	2 U
Butylbenzylphthalate	0.05 J	0.5 U	0.07 J	0.5 U
Chrysene	0.2 U	0.4 J	0.1 J	0.2 U
Dibenz(a,h)anthracene	0.3 U	0.05 J	0.3 U	0.3 U
Diethylphthalate	0.5 U	0.5 U	0.04 J	0.5 U
Di-n-butylphthalate	0.06	0.04 J	0.05 J	0.5 U
Fluorene	0.5 U	0.07 J	0.08 J	0.5 U
Indeno(1,2,3-cd)pyrene	0.4 U	0.1 U	0.04 J	0.4 U
Phenanthrene	0.5 U	0.2 J	0.06 J	0.5 U
Pyrene	0.5 U	0.8 J	0.5 J	0.5 U
METHOD: EPA 515.1				
PESTICIDES/PCB COMPOUNDS: (µg/L)				
3,5-Dichlorobenzoic acid	0.4 J	2 U	2 U	--
Dacthal	0.5 U	0.03 J	0.5 U	--
METHOD: EPA 508				
PESTICIDES/PCB COMPOUNDS: (µg/L)				
Dieldrin	0.005 J	0.06 U	0.06 U	--

(1) = Duplicate for B20MW-2

(L) = Lancaster Laboratories, Inc.
µg/L = micrograms per liter
J = Estimated concentration
U = Analyte not detected

PREPARED/DATE: CLC 7/25/95
CHECKED/DATE: DSS 8/2/95

**Table 4.6: Frequency of Detection and Exceedance of Potential ARARs or TBCs for Ground–Water Samples
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York**

			Comparison to ARARs and TBCs		Comparison to Background	
Parameter	Frequency of Detection	Range of Detected Concentrations	Frequency of Detection Above Most Stringent	Most Stringent Criterion	Frequency of Detection Above Background	Background Screening Concentration
Volatiles (µg/L)						
1,1,1–Trichloroethane	2/3	0.8 – 1.4	0	5	--	NA
Chloroform	2/3	0.3 – 0.4	0	7	--	NA
Naphthalene	1/3	3.4	0	10	--	NA
Trichloroethylene (TCE)	1/3	0.4 J	0	3	--	NA
Semi–Volatiles (µg/L)						
Acenaphthylene	1/4	0.06 J	0	20	--	NA
Anthracene	2/4	0.04 J – 0.2 J	0	50	--	NA
Benzo (a) anthracene	2/4	0.2 J – 0.3 J	2	0.002	--	NA
Benzo (a) pyrene	2/4	0.2 J	2	0.002	--	NA
Benzo (b) fluoranthene	2/4	0.2 J – 0.4 J	2	0.002	--	NA
Benzo (g,h,i) perylene	2/4	0.09 J – 0.2 J	0	50	--	NA
Benzo (k) fluoranthene	2/4	0.08 J – 0.09 J	2	0.002	--	NA
Benzyl butyl phthalate	2/4	0.05 J – 0.07 J	0	50	--	NA
Chrysene	2/4	0.3 J – 0.4 J	2	0.002	--	NA
Di–n–butyl phthalate	3/4	0.05 J – 0.08 J	0	50	--	NA
Dibenzo (a,h) anthracene	1/4	0.05 J	0	0.3	--	NA
Diethyl phthalate	1/4	0.04 J	0	50	--	NA
Dioctyl adipate	1/3	2 J	0	50	--	NA
Fluorene	2/4	0.08 J – 1 J	0	50	--	NA
Indeno (1,2,3–cd) pyrene	2/4	0.04 J – 0.09 J	2	0.002	--	NA
Phenanthrene	2/4	0.2 J – 3 J	0	50	--	NA
Pyrene	2/4	0.8 J – 1 J	0	50	--	NA
Pestides/PCB Compounds (µg/L)						
3,5–Dichlorobenzoic acid	1/3	0.4 J	0	5	--	NA
Alpha endosulfan	1/4	0.001 J	0	50	--	NA
Chloroneb	1/4	0.045 J	0	5	--	NA
Coumaphos	1/1	0.2 J	0	5	--	NA
DCPA (Dacthal)	1/6	0.03 J	0	5	--	NA
Dieldrin	1/4	0.005 J	1	0.001	--	NA
Sevin (Carbaryl)	1/3	0.3 J	0	29	--	NA
Trifluralin	1/4	0.006 J	0	35	--	NA
Metals (mg/L)						
Aluminum	2/3	0.66 – 1.02	2	0.05	2	0.43
Antimony	1/3	0.0142 J	1	0.003	1	0.003 U
Arsenic	3/3	0.00389 J – 0.0098	0	0.025	1	0.005 U
Barium	3/3	0.024 – 0.063	0	1	1	0.057
Calcium	3/3	56.7 – 106	--	NA	1	77
Chromium, hexavalent	1/3	0.002 J	0	0.05	0	0.016
Chromium, total	2/3	0.0142 J – 0.114 J	1	0.05	1	0.02 U
Copper	2/3	0.004 J – 0.01	0	0.1	0	0.01 U
Iron	3/3	0.088 J – 2.65 J	2	0.3	2	0.75
Lead	2/3	0.00099 J – 0.00119 J	0	0.015	0	0.007
Magnesium	3/3	5.58 – 15.5 J	--	NA	1	14
Manganese	3/3	0.088 – 0.816	3	0.05	2	0.14
Molybdenum	3/3	0.0045 J – 0.0107 J	--	NA	0	0.016
Nickel	2/3	0.0144 J – 0.073	0	0.1	1	0.04 U
Potassium	3/3	1.98 – 35.4	--	NA	1	12
Selenium	3/3	0.00075 J – 0.0012	0	0.01	0	0.001
Sodium	3/3	36.8 – 384	3	20	3	23
Strontium	3/3	0.116 – 0.394	--	NA	1	0.21
Thallium	3/3	0.00045 J – 0.005 J	1	0.001	1	0.0018
Vanadium	2/3	0.0045 J – 0.0049 J	--	NA	0	0.015
Zinc	3/3	0.0063 J – 0.0161 J	0	0.3	0	0.019
Wet Chemistry (mg/L)						
Petroleum Hydrocarbons	3/3	0.09 J – 0.13 J	1	0.1	--	NA

NA – Not Applicable
J – Estimated Value
µg/L – micrograms per liter
mg/L – milligrams per liter
U – Analyte not detected at the indicated detection limit

PREPARED/DATE: DSS 7/25/95
CHECKED/DATE: LAS 8/2/95

**Table 6.1: Selection of Chemicals of Potential Concern Detected in Soil
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York**

Parameter	Frequency of Detection	Range of Detected Concentrations (mg/kg) (a)	Background Screening Concentration (b)
Volatiles			
* Acetone	2/4	0.004 J–0.06	--
* Benzene	1/4	0.003 J	--
* Ethylbenzene	1/4	0.01	--
* Toluene	2/4	0.002 J–0.008	--
* Xylene (total)	1/4	0.056	--
Semi-volatiles			
* 2,4-Dimethylphenol	1/4	0.13 J	--
* 2-Methylnaphthalene	1/4	29	--
* Acenaphthene	2/4	0.011 J–10	--
* Acenaphthylene	1/4	1.7	--
* Anthracene	2/4	0.03 J–9.7	--
* Benzo(a)anthracene	1/4	31 J	--
* Benzo(a)pyrene	1/3	0.052 J	--
* Benzo(b)fluoranthene	2/3	0.036 J–0.067 J	--
* Benzo(k)fluoranthene	1/3	0.036 J	--
* bis(2-Ethylhexyl) phthalate	4/4	0.039 J–0.19 J	--
* Carbazole	1/2	4.5	--
* Chrysene	1/4	38 J	--
* Dibenzofuran	1/4	5	--
* Fluoranthene	2/4	0.13 J–55	--
* Fluorene	1/4	28	--
* Naphthalene	1/4	11	--
* Phenanthrene	3/4	0.13 J–75	--
* Pyrene	2/4	0.1 J–73 J	--
Pesticides/PCBs			
* 4,4'-DDD	1/4	0.0099 J	--
* Aldrin	1/4	0.0072 J	--
* gamma-BHC	1/2	0.00013 J	--
* Heptachlor epoxide	1/4	0.0053 J	--
* Mirex	1/2	0.00095 J	--
* PCB-1260	1/4	0.0064 J	--

Table 6.1: Selection of Chemicals of Potential Concern Detected in Soil
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Parameter	Frequency of Detection	Range of Detected Concentrations (mg/kg) (a)	Background Screening Concentration (b)
Total Metals			
Aluminum	4/4	5720–11200	18306
Arsenic	4/4	2.7–4.2	4.9
Barium	4/4	37–68	71
Beryllium	2/4	0.419 J–0.471 J	0.65
Calcium	4/4	1950–74800	$\boxed{23821^{c}}$
* Chromium	4/4	9.8–27.7 J	$\boxed{22.6}$
* Chromium, hexavalent	4/7	0.39–0.58	$\boxed{0.45}$
* Cobalt	4/4	5.2–19.4	$\boxed{19.3}$
Copper	4/4	8.4 J–24.2	43.8
Iron	4/4	16000–18200	47350
Lead	4/4	6–27	36
Magnesium	4/4	2570–3980	7175
Manganese	4/4	415–723 J	2106
Mercury	2/4	0.032 J–0.041 J	0.1 U
* Molybdenum	1/4	6.4	$\boxed{6\ U}$
Nickel	4/4	11.9–41.6 J	46
Potassium	4/4	740–921	1993
* Selenium	2/4	0.76 J–1.11 J	$\boxed{0.34\ U}$
* Silver	2/4	0.61 J–6.4 J	$\boxed{1.1\ U}$
Sodium	3/4	196–598	$\boxed{259^{c}}$
* Strontium	4/4	6.55–112	$\boxed{55}$
Vanadium	4/4	12.6–29.7	36
Zinc	4/4	35.3–52	120
Wet Chemistry			
Petroleum Hydrocarbons	4/4	40–4400	--

Note: The Exposure Point Concentration used in the risk calculation tables will be the maximum detected concentration.
* Selected as a chemical of potential concern (COPC)
☐ Box indicates maximum sample concentration exceeds twice the mean background concentration.
(a) – Based on chemical analysis results for soil boring samples (0 to 7 feet bgs).
(b) – Background screening concentrations for metals are two times the arithmetic mean.
(c) – Essential human nutrient; not considered as a COPC.
J – Indicates an estimated value
U – Analyte not detected at indicated detection limit

PREPARED/DATE: TMS 7/21/95
CHECKED/DATE: LAS 8/7/95

Table 6.2: Selection of Chemicals of Potential Concern Detected in Ground Water
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Parameter	Frequency of Detection	Range of Detected Concentrations (mg/L) (a)	Arithmetic Mean Concentration (mg/L) (b)	95 Percent Upper Confidence Limit (mg/L) (c)	Background Screening Concentration (mg/L) (d)
Volatiles					
• 1,1,1-Trichloroethane	2/7	0.0008-0.0014	0.0016	NA	NA
• Acetone	1/7	0.003 J	0.0068	NA	NA
• Chloroform	2/7	0.0003-0.0004	0.0012	NA	NA
• Methylene chloride	1/7	0.0015 J	0.00175	NA	NA
• Naphthalene	1/7	0.0034	0.0013	NA	NA
• Trichloroethene	1/7	0.0004 J	0.0013	NA	NA
Semi-volatiles					
• Acenaphthylene	1/8	0.00006 J	0.00217	NA	NA
• Anthracene	2/8	0.00004 J-0.0002 J	0.00216	NA	NA
• Benzo(a)anthracene	2/8	0.0002 J-0.0003 J	0.00208	NA	NA
• Benzo(a)pyrene	2/8	0.0002 J	0.00208	NA	NA
• Benzo(b)fluoranthene	2/8	0.0002 J-0.0004 J	0.0022	NA	NA
• Benzo(g,h,i)perylene	2/4	0.00009 J-0.0002 J	0.0002	NA	NA
• Benzo(k)fluoranthene	2/8	0.00008 J-0.00009 J	0.00212	NA	NA
• Benzyl butyl phthalate	2/8	0.00005 J-0.00007 J	0.00215	NA	NA
• Chrysene	2/8	0.0003 J-0.0004 J	0.00218	NA	NA
• Dibenz(a,h)anthracene	1/4	0.00005 J	0.000125	NA	NA
• Di-n-butylphthalate	3/8	0.00005 J-0.00008 J	0.00225	NA	NA
• Diethyl phthalate	2/8	0.00004 J-0.0027	0.00188	NA	NA
• Fluorene	2/8	0.00008 J-0.001 J	0.0023	NA	NA
• Indeno(123-cd)pyrene	2/4	0.00004 J-0.00009 J	0.00013	NA	NA
• Phenanthrene	2/8	0.0002 J-0.003 J	0.0025	NA	NA
• Pyrene	2/8	0.0008 J-0.001 J	0.0024	NA	NA
• bis(2-Ethylhexyl)adipate	1/3	0.002 J	0.0013	NA	NA
Pesticides/PCBs					
• 3,5-Dichlorobenzoic acid	1/3	0.0004 J	0.0008	NA	NA
• Carbaryl	1/3	0.0003 J	0.0014	NA	NA
• Chloroneb	1/4	0.000045 J	0.00039	NA	NA
• Coumaphos	1/1	0.0002 J	0.0002	NA	NA
• Dacthal (DCPA)	1/6	0.00003 J	0.0001	NA	NA
• Dieldrin	1/8	0.000005 J	0.000027	NA	NA
• Endosulfan I	1/8	0.000001 J	0.00003	NA	NA
• Trifluralin	1/4	0.000006 J	0.000024	NA	NA
Total Metals					
• Aluminum	3/7	0.66-1.02	0.435	NA	$\boxed{0.43}$
• Antimony	1/7	0.0142 J	0.017	NA	$\boxed{0.0030\ U}$
• Arsenic	3/7	0.0039 J-0.0098	0.0049	NA	$\boxed{0.005\ U}$
• Barium	7/7	0.024-0.063	0.047	NA	$\boxed{0.057}$
Calcium	7/7	56.7-121	97	NA	$\boxed{77}$ (e)
• Chromium, total	4/7	0.0142 J-0.114 J	0.037	NA	$\boxed{0.020\ U}$
Chromium, hexavalent	1/7	0.002 J	0.011	NA	0.016
• Copper	3/7	0.004 J-0.012	0.007	NA	$\boxed{0.010\ U}$
Iron	7/7	0.084 J-2.65 J	0.745	NA	$\boxed{0.75}$ (e)
Lead	2/7	0.00099 J-0.00119 J	0.002	NA	0.0073
Magnesium	7/7	5.58-155 J	9.21	NA	$\boxed{14}$ (e)
• Manganese	5/7	0.088-0.816	0.24	NA	$\boxed{0.14}$
Molybdenum	3/3	0.0045 J-0.0107 J	0.007	NA	0.016
• Nickel	5/7	0.0144 J-0.276	0.11	NA	$\boxed{0.040\ U}$
Potassium	7/7	1.98-73	35	NA	$\boxed{12}$ (e)
• Selenium	3/7	0.00075 J-0.0012	0.0015	NA	$\boxed{0.00115}$
Sodium	7/7	36.8-384	198	NA	$\boxed{23}$ (e)
• Strontium	3/3	0.116-0.394	0.232	NA	$\boxed{0.21}$
• Thallium	3/7	0.00045 J-0.005 J	0.003	NA	$\boxed{0.0018}$
Vanadium	2/7	0.0045 J-0.0049 J	0.007	NA	$\boxed{0.015}$
• Zinc	7/7	0.0063 J-0.248 J	0.086	NA	$\boxed{0.019}$
Wet Chemistry					
Petroleum Hydrocarbons	3/3	0.09 J-0.13 J	0.103	NA	NA

Note: The Exposure Point Concentration used in the risk calculation tables will be the maximum detected concentration.
• Selected as chemical of potential concern (COPC)
$\boxed{}$ Box indicates maximum sample concentration exceeds twice the mean background concentration.
(a) – Based on chemical analysis results for monitoring well samples including samples from 3 wells collected during the RI and quarterly samples results from B20MW-1.
(b) – Arithmetic mean calculated using one-half the SQL for nondetect samples. Note that elevated SQLs may result in mean greater than maximum detected concentration.
(c) – Calculated for data sets containing ten or more samples
(d) – Background screening concentrations for metals are twice the arithmetic mean.
(e) – Not selected as COPC because chemical is considered an essential human nutrient.
NA – Not Applicable
J – Indicates an estimated value
U – Analyte not detected; value shown is the sample quantitation limit

PREPARED/DATE: TMS 7/21/95
CHECKED/DATE: LAS 8/7/95

Table 6.3: Summary of Occupational Human Health Risks – Future Utility Worker Exposure Scenario
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

	Utility Worker			
Pathway	Adult HQ	Chemical(s) Driving Noncarcinogenic Hazard(a)	Lifetime Excess Cancer Risk	Chemical(s) Driving Risk(a)
SOIL				
Inhalation of Fugitive Dust	0.0002	--	3E-10	--
Dermal Contact with Soils	--	--	5E-09	--
Incidental Ingestion	0.001	--	1E-06	Benzo(a)anthracene
Total for Surface Soil	0.001		1E-06	
GROUND WATER				
Ingestion	NA	--	NA	--
Inhalation of Volatiles	NA	--	NA	--
Dermal Contact	NA	--	NA	--
Total for Ground Water	NA		NA	
TOTAL FOR ALL PATHWAYS	0.001		1E-06	

NA – Not applicable
(a) Chemicals contributing cancer risk > $1x10^{-6}$ and/or HQ > 1 are listed.

947 84

Table 6.4: Summary of Occupational Human Health Risks – Future Construction Worker Exposure Scenario
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

	Construction Worker			
Pathway	Adult HQ	Chemical(s) Driving Noncarcinogenic Hazard(a)	Lifetime Excess Cancer Risk	Chemical(s) Driving Risk(a)
SOIL				
Inhalation of Fugitive Dust	0.001	--	8E-11	--
Dermal Contact	--	--	1E-09	--
Incidental Ingestion	0.05	--	2E-06	benzo(a)anthracene
Total for Surface Soil	0.05		2E-06	
GROUND WATER				
Ingestion	NA	--	NA	--
Inhalation of Volatiles	NA	--	NA	--
Dermal Contact	NA	--	NA	--
Total for Ground Water	NA		NA	
TOTAL FOR ALL PATHWAYS	0.05		2E-06	

NA – Not applicable
(a) Chemicals contributing cancer risk > 1x10^{-6} and/or HQ>1 are listed.

947 85

Table 6.5: Summary of Occupational Human Health Risks – Future Industrial Worker Exposure Scenario
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Pathway	Adult HQ	Chemical(s) Driving Noncarcinogenic Hazard (a)	Industrial Worker Lifetime Excess Cancer Risk	Chemical(s) Driving Risk (a)
SOIL				
Inhalation of Fugitive Dust	NA	--	NA	--
Dermal Contact	NA	--	NA	--
Incidental Ingestion	NA	--	NA	--
Total for Subsurface Soil	NA		NA	
GROUND WATER				
Dermal Contact	0.01	--	5E-05	Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(a)anthracene, Dibenzo(a,h)anthracene, & Indeno(123-cd)pyrene
Inhalation of Volatiles	2E-06	--	4E-09	--
Ingestion	2	--	6E-05	Arsenic, Benzo(a)pyrene, Benzo(b)fluoranthene, & Dibenzo(a,h)anthracene
Total for Ground Water	2		1E-04	
TOTAL FOR ALL PATHWAYS	2		1E-04	

-- Not applicable
(a) Chemicals contributing cancer risk > $1x10^{-6}$ and/or HQ>1 are listed.

PREPARED/DATE: PJR 6/16/95
CHECKED/DATE: LAS 7/14/95

947 86

Table 6.6: Evaluation of Uncertainties
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

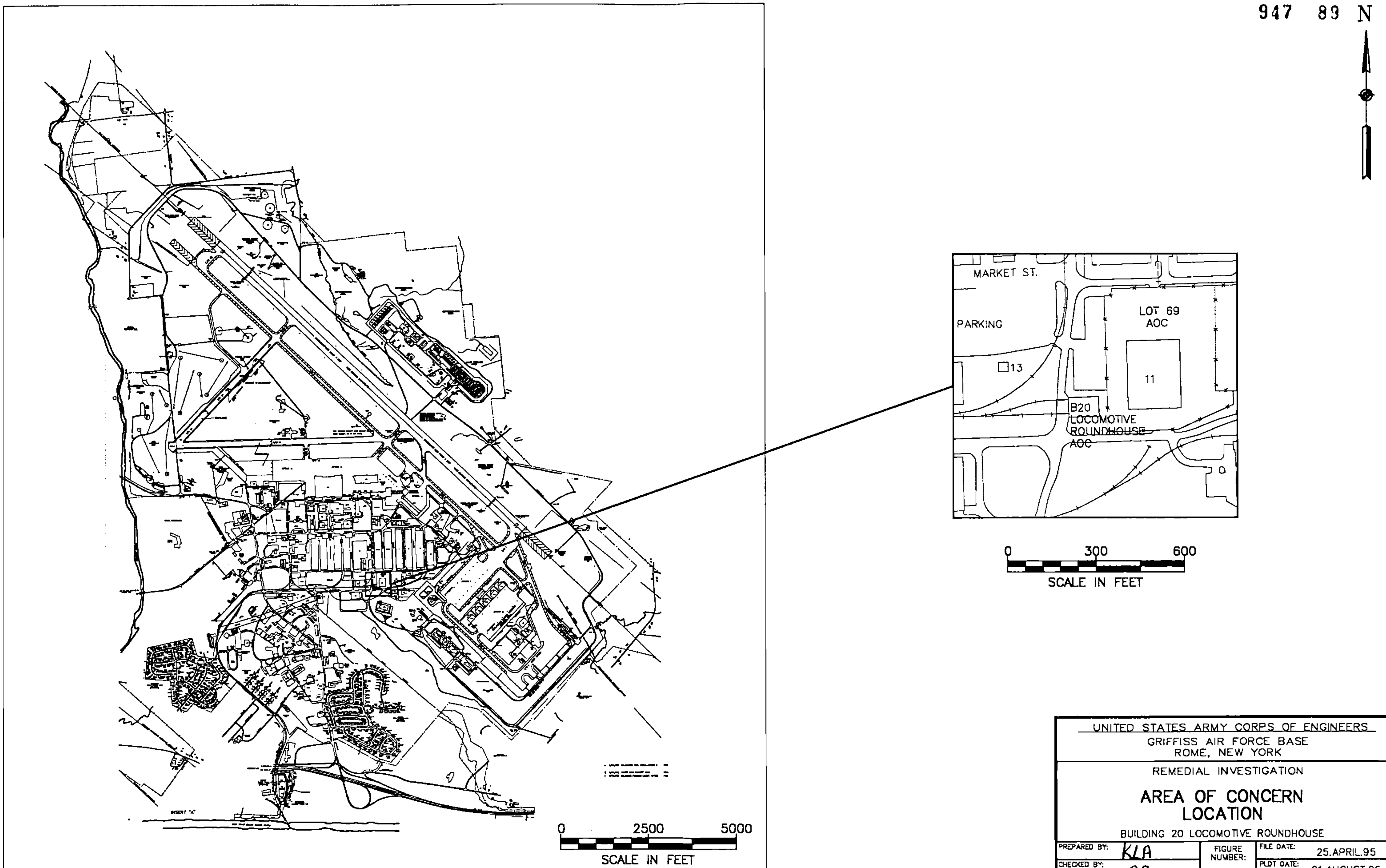
ASSUMPTIONS	POTENTIAL EFFECT ON RISK May Overestimate	May Underestimate
Environmental Sampling and Analysis		
Proxy concentrations for nondetect samples assigned as one-half the method detection limit	X	X
Samples collected from areas of suspected contamination only	X	
Analytical results for several PAHs in sample B20SB-5b were rejected and could not be used in the risk assessment		X
Fate and Transport of Constituents:		
Use of wind erosion model and box model to estimate concentrations of contaminants in fugitive dust	X	X
No degradation or dispersion of contamints assumed for estimating future exposure point concentrations	X	
Exposure Pathways and Parameters:		
Possible future change in land use assumptions	X	X
Standard exposure parameters may not be respresentative of the actual exposed population	X	X
Maximum concentrations of COPCs detected in soils and ground water used as exposure point concentrations	X	
Intake by soil and ground-water pathways is assumed to be constant over the exposure duration	X	X
Assumed use of ground-water for industrial purposes	X	
Toxicity Assessment:		
Lack of toxicity data (oral and inhalation RfDs and CSFs); qualitative toxicity evaluation when no toxicity evaluation values available		X
Use of administered RfDs and CSFs to quantitate dermal exposure to ground water	X	X
Use of TEF approach for determining toxicity values for PAHs	X	X
Use of chronic toxicity values to evaluate exposures of one year for construction workers	X	

PREPARED/DATE: TMS 7/21/95
CHECKED/DATE: LAS 8/2/95

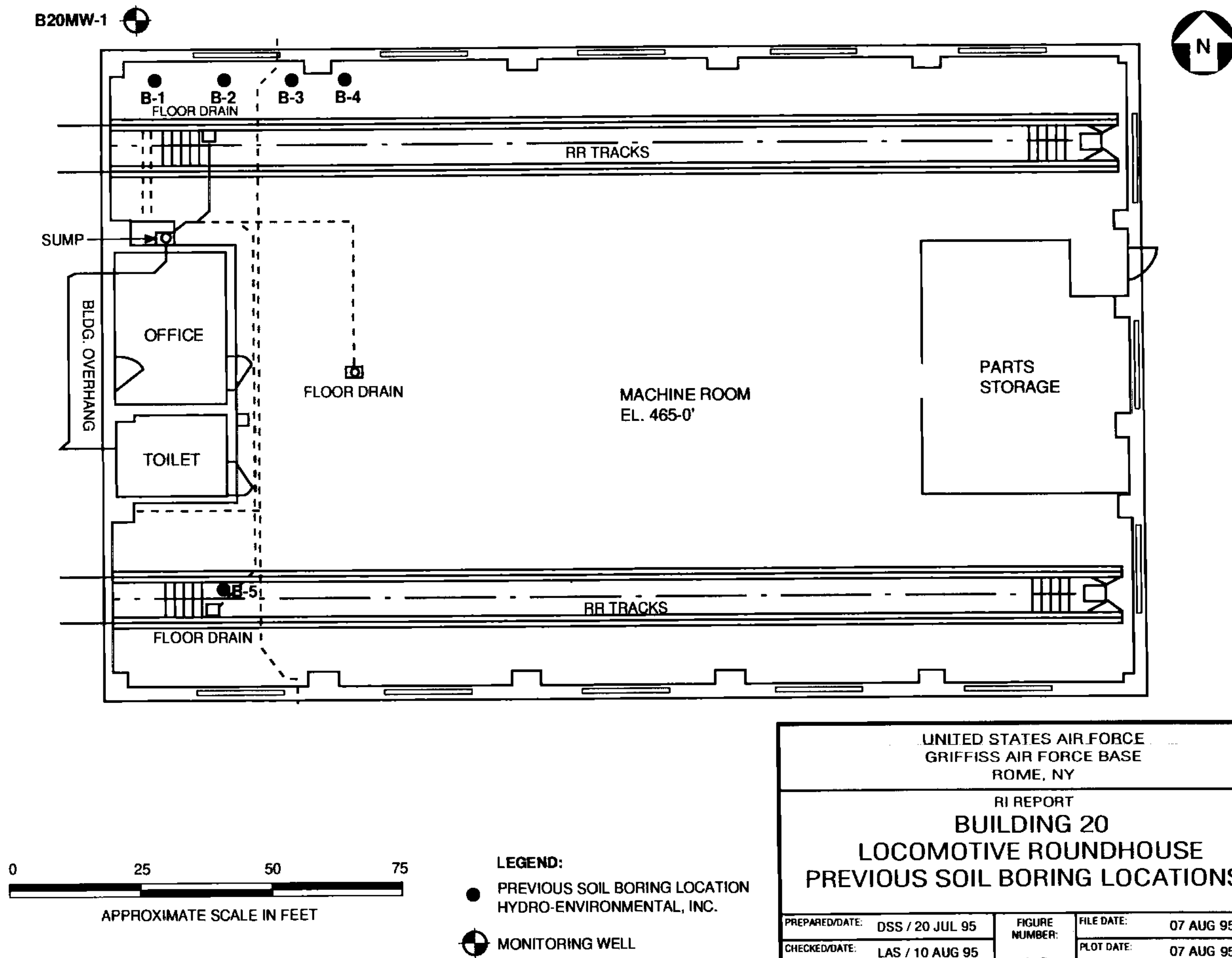
947 88

TAB

Figures



UNITED STATES ARMY CORPS OF ENGINEERS GRIFFISS AIR FORCE BASE ROME, NEW YORK			
REMEDIAL INVESTIGATION			
AREA OF CONCERN LOCATION BUILDING 20 LOCOMOTIVE ROUNDHOUSE			
PREPARED BY: KLA	FIGURE NUMBER:	FILE DATE:	25.APRIL.95
CHECKED BY: LAS	1.1	PLOT DATE:	01.AUGUST.95
PROJECT NO. 11-2588-0211		FILE NAME:	ROUNDMAP.DWG

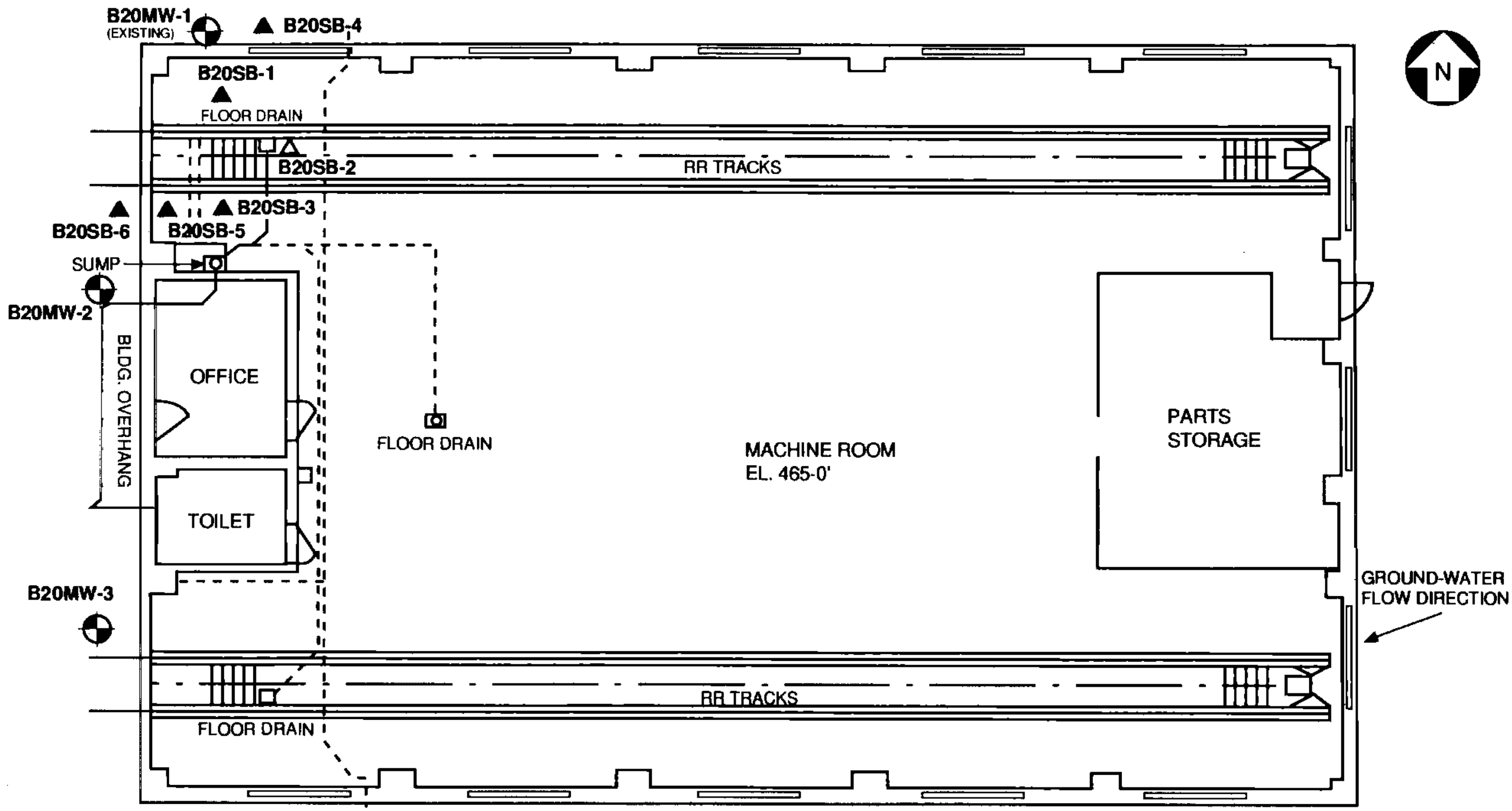


UNITED STATES AIR FORCE
GRIFFISS AIR FORCE BASE
ROME, NY

RI REPORT

BUILDING 20
LOCOMOTIVE ROUNDHOUSE
PREVIOUS SOIL BORING LOCATIONS

PREPARED/DATE: DSS / 20 JUL 95	FIGURE NUMBER:	FILE DATE: 07 AUG 95
CHECKED/DATE: LAS / 10 AUG 95	1.2	PLOT DATE: 07 AUG 95
PROJECT NO.: 11-2588-0211		FILE NAME: 11-2588-0211.21



0 25 50 75

APPROXIMATE SCALE IN FEET

LEGEND:

- ▲ SOIL BORING
- MONITORING WELL
- △ SOIL BORING/GRAB GROUND-WATER

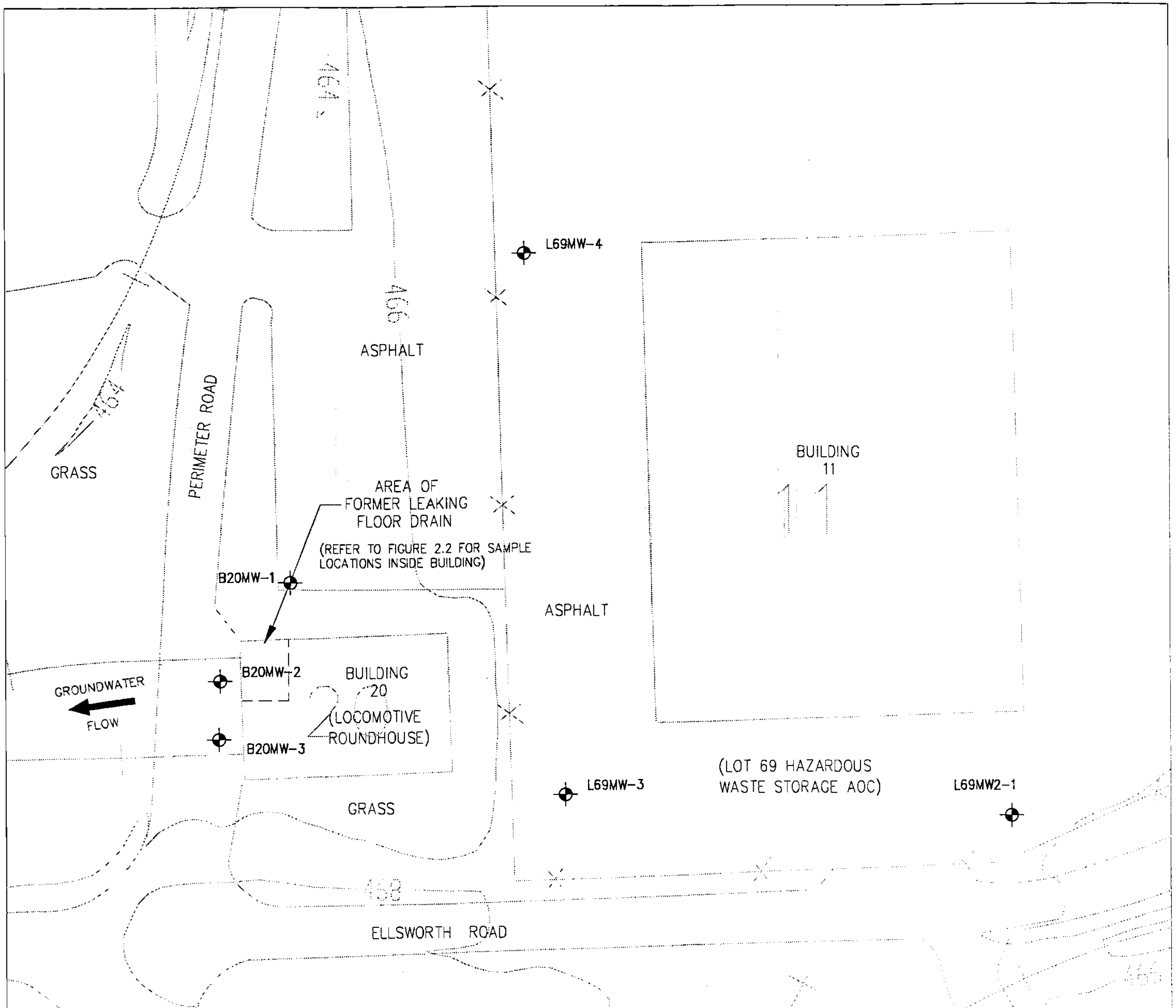
NOTE: Boring locations are not to scale.

UNITED STATES AIR FORCE
GRIFFISS AIR FORCE BASE
ROME, NY

RI REPORT

SOIL BORING AND MONITORING WELL LOCATIONS

PREPARED/DATE:	DSS / 20 JUL 95	FIGURE NUMBER:	FILE DATE:	07 AUG 95
CHECKED/DATE:	LAS / 10 AUG 95	2.1	PLOT DATE:	07 AUG 95
PROJECT NO.:	11-2588-0211		FILE NAME:	11-2588-0211.21



LEGEND:

MONITORING WELL

0 50 100

SCALE IN FEET

TOPOGRAPHIC CONTOUR INTERVAL 2 FEET

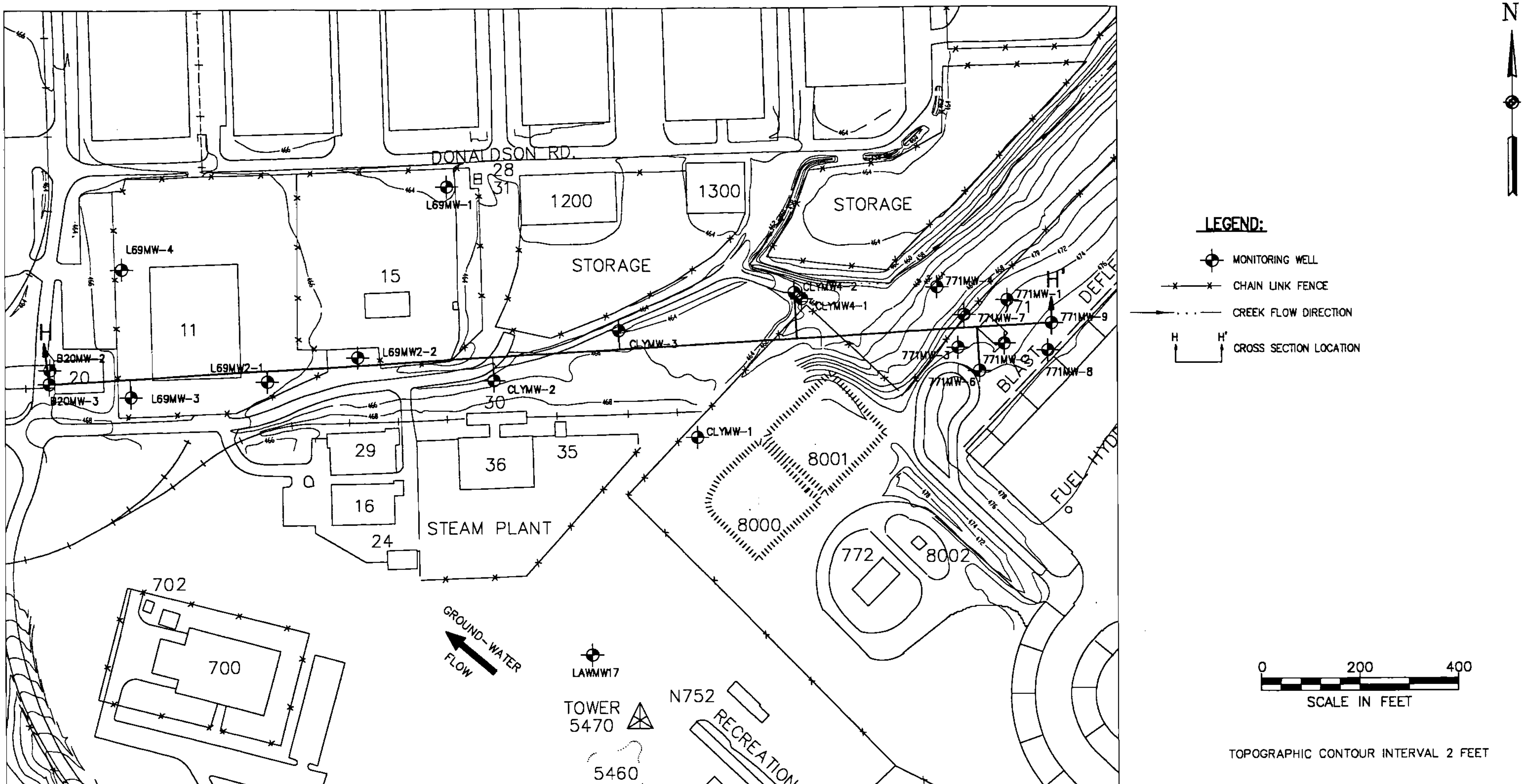
UNITED STATES AIR FORCE
GRIFFISS AIR FORCE BASE
ROME, NEW YORK

RI REPORT

MONITORING WELL LOCATIONS

BUILDING 20 – LOCOMOTIVE ROUNDHOUSE

PREPARED BY: DSS	FIGURE NUMBER:	FILE DATE: 05.DEC.94	
CHECKED BY: K_A	2.2	PLOT DATE: 15.AUGUST.96	
PROJECT NUMBER: 11-2588-0211		FILE NAME: 20-LOCRH.DWG	

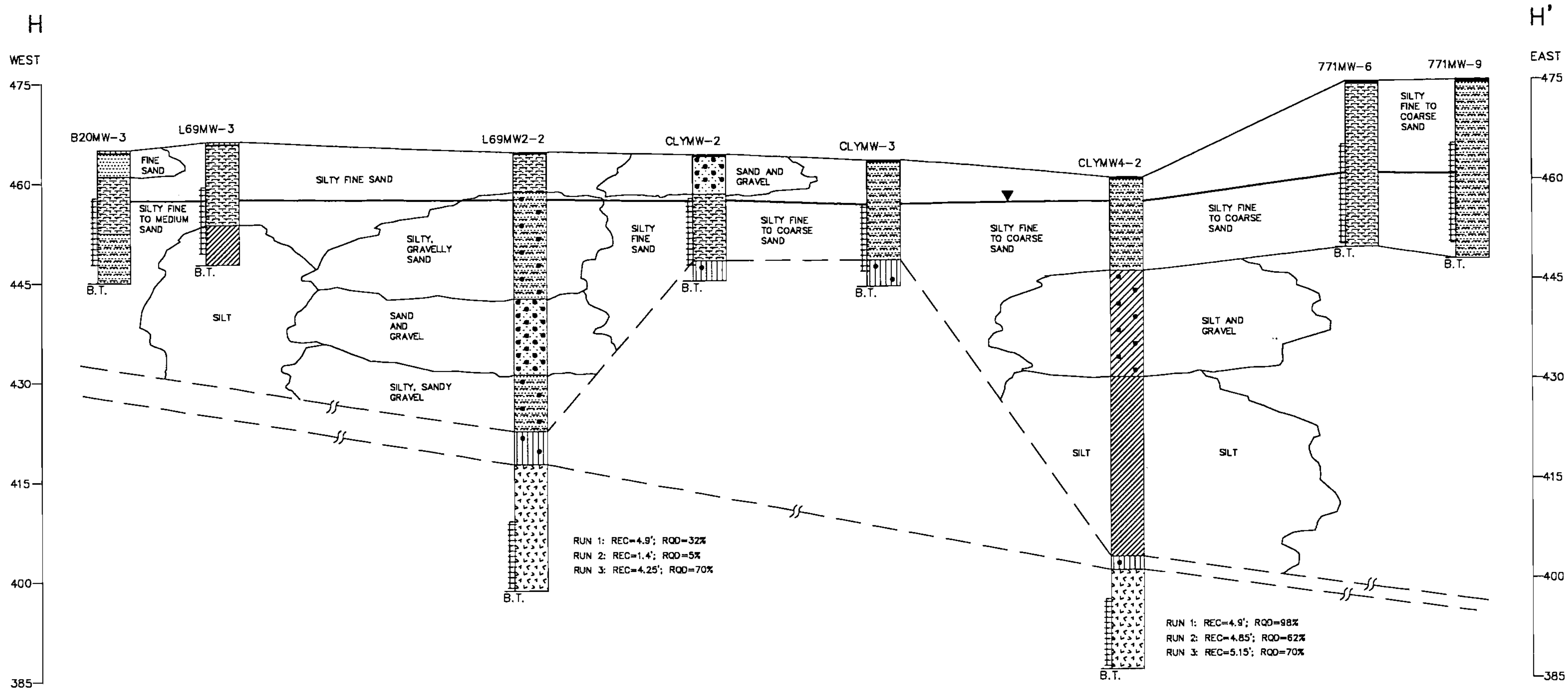


UNITED STATES AIR FORCE
GRIFFISS AIR FORCE BASE
ROME, NEW YORK
RI REPORT

GEOLOGIC CROSS SECTION H-H' LOCATION MAP

BUILDING 20 / LOT 69 / COAL STORAGE YARD

PREPARED BY: DSS	FIGURE NUMBER: 3.1	FILE DATE:	18.MAY.95
CHECKED BY: QMD		PLOT DATE:	25.NOVEMBER.96
PROJECT NUMBER: 11-2588-0211		FILE NAME:	HHLOCMAP.DWG



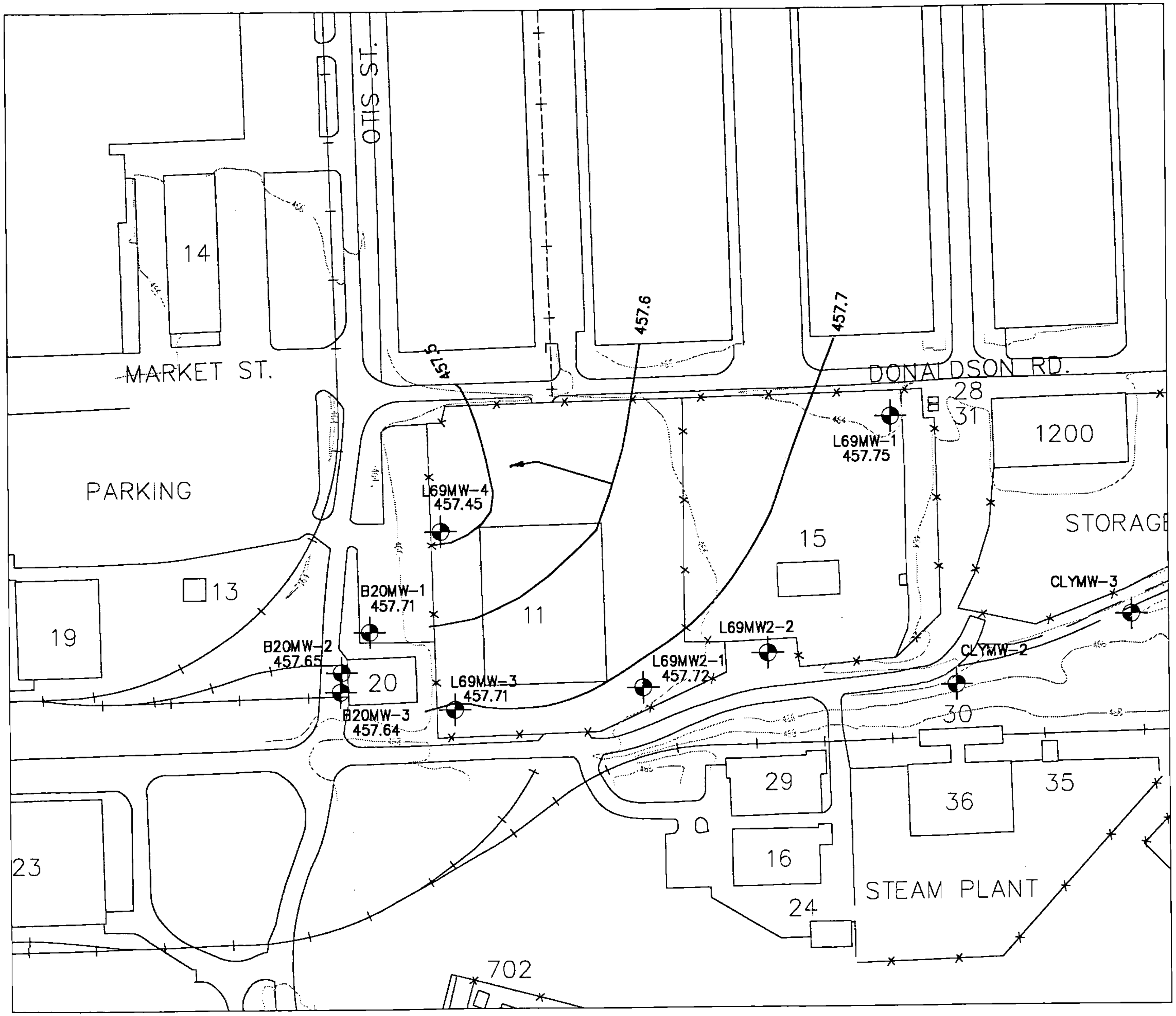
NOTE: THE CORRELATIONS SHOWN ARE INTERPRETED FROM FIELD DESCRIPTIONS OF STRATA ENCOUNTERED IN THE DEPICTED BORINGS. IN SOME CASES, CORRELATIONS EXTEND BETWEEN STRATA WHICH WERE NOT FULLY PENETRATED, FOR WHICH SAMPLE RECOVERIES WERE INSUFFICIENT FOR SOIL DESCRIPTION OR FOR WHICH SAMPLES WERE NOT COLLECTED. THE DEPTHS TO STATIC GROUNDWATER DURING DRILLING ARE SHOWN FOR EACH WELL. THE WATER TABLE IS INTERPRETED BETWEEN THESE POINTS.

LEGEND:

- TOPSOIL
- CONCRETE
- ▼ WATER TABLE
- MONITORING WELL SCREEN INTERVAL

SCALE IN FEET: 0 – 150 (horizontal); 15 (vertical)

UNITED STATES AIR FORCE GRIFFISS AIR FORCE BASE ROME, NEW YORK		
RI REPORT INTERPRETED GEOLOGIC CROSS SECTION H–H' BUILDING 20/ LOT 69/ COAL STORAGE YARD		
PREPARED BY: DSS	FIGURE NUMBER: 3.2	FILE DATE: 05.JUNE.95
CHECKED BY: PNV		PLOT DATE: 25.NOVEMBER.96
PROJECT NO. 11-2588-0211		FILE NAME: SECT-CSY.DWG



LEGEND:

- MONITORING WELL
- FENCE
- RAILROAD TRACKS
- ABANDONED RAILROAD TRACKS
- 456 TOPOGRAPHIC CONTOUR
- INTERPRETED DIRECTION OF GROUND-WATER FLOW
- 468 GROUND-WATER CONTOUR

NOTES:

WATER LEVEL FOR L69MW2-2 (BEDROCK WELL) WAS NOT USED TO DETERMINE THE GROUND-WATER FLOW DIRECTION

GROUND-WATER CONTOURS CREATED USING SURFER (VERSION 4.15)

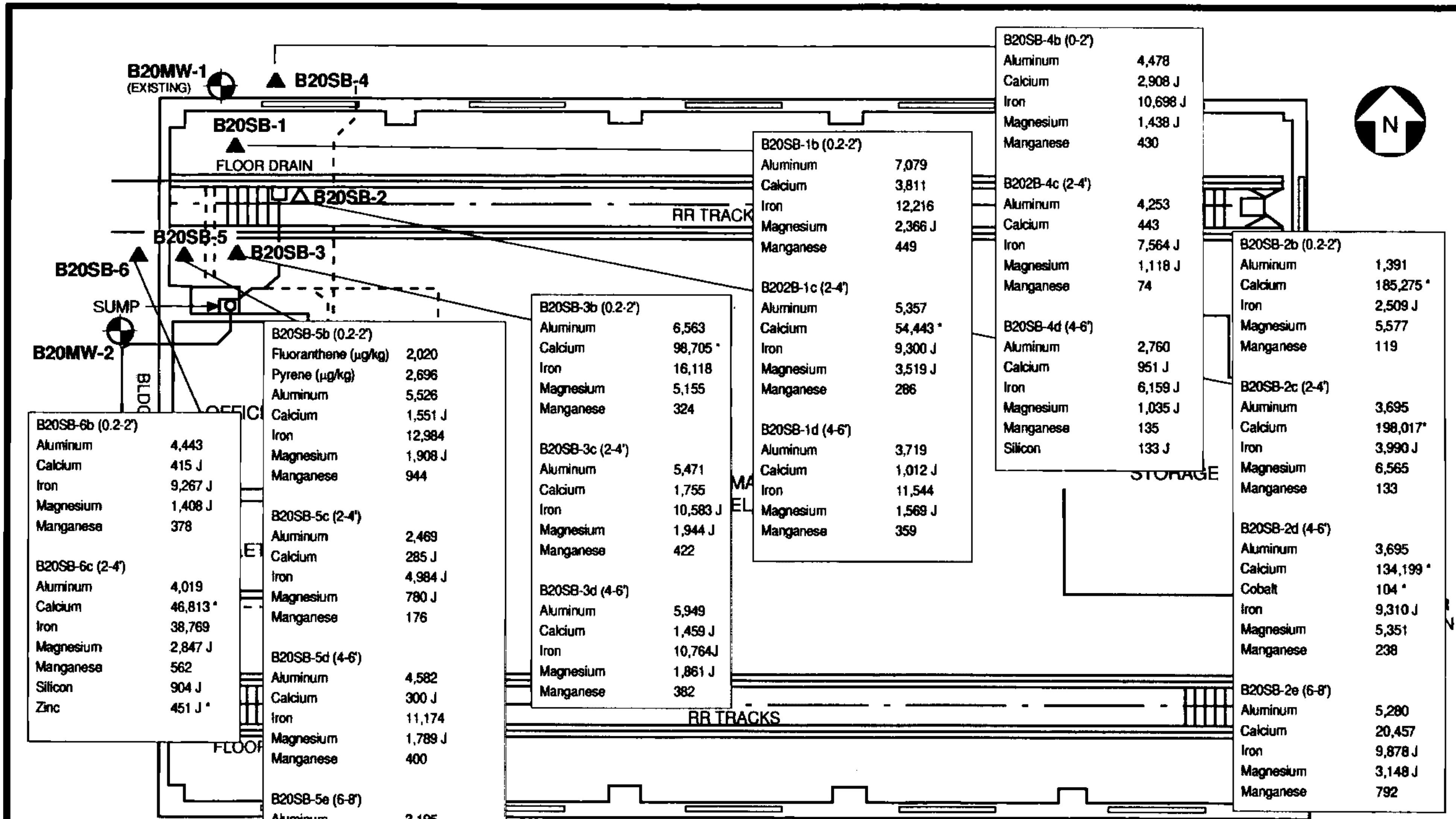
TOPOGRAPHIC CONTOUR INTERVAL = 2 FEET

UNITED STATES AIR FORCE
GRIFFISS AIR FORCE BASE
ROME, NEW YORK
RI REPORT

GROUND-WATER POTENTIOMETRIC SURFACE MAP

BUILDING 20 / LOT 69

PREPARED BY:	DSS	FIGURE NUMBER:	FILE DATE:	12.JUNE.95
CHECKED BY:	LAS	3.3	PLOT DATE:	02.DECEMBER.96
PROJECT NUMBER:	11-2588-0211		FILE NAME:	B20-POT.DWG



B20SB-6b (0.2-2')	
Aluminum	4,443
Calcium	415 J
Iron	9,267 J
Magnesium	1,408 J
Manganese	378

B20SB-6c (2-4')	
Aluminum	4,019
Calcium	46,813 *
Iron	38,769
Magnesium	2,847 J
Manganese	562
Silicon	904 J
Zinc	451 J *

B20SB-5b (0.2-2')	
Fluoranthene (µg/kg)	2,020
Pyrene (µg/kg)	2,696
Aluminum	5,526
Calcium	1,551 J
Iron	12,984
Magnesium	1,908 J
Manganese	944

B20SB-5c (2-4')	
Aluminum	2,469
Calcium	285 J
Iron	4,984 J
Magnesium	780 J
Manganese	176

B20SB-5d (4-6')	
Aluminum	4,582
Calcium	300 J
Iron	11,174
Magnesium	1,789 J
Manganese	400

B20SB-5e (6-8')	
Aluminum	3,195
Calcium	669 J
Iron	9,567 J
Magnesium	1,515 J
Manganese	615

B20SB-3b (0.2-2')	
Aluminum	6,563
Calcium	98,705 *
Iron	16,118
Magnesium	5,155
Manganese	324

B20SB-3c (2-4')	
Aluminum	5,471
Calcium	1,755
Iron	10,583 J
Magnesium	1,944 J
Manganese	422

B20SB-3d (4-6')	
Aluminum	5,949
Calcium	1,459 J
Iron	10,764J
Magnesium	1,861 J
Manganese	382

B20SB-1b (0.2-2')	
Aluminum	7,079
Calcium	3,811
Iron	12,216
Magnesium	2,366 J
Manganese	449

B202B-1c (2-4')	
Aluminum	5,357
Calcium	54,443 *
Iron	9,300 J
Magnesium	3,519 J
Manganese	286

B20SB-1d (4-6')	
Aluminum	3,719
Calcium	1,012 J
Iron	11,544
Magnesium	1,569 J
Manganese	359

B20SB-4b (0-2')	
Aluminum	4,478
Calcium	2,908 J
Iron	10,698 J
Magnesium	1,438 J
Manganese	430

B202B-4c (2-4')	
Aluminum	4,253
Calcium	443
Iron	7,564 J
Magnesium	1,118 J
Manganese	74

B20SB-4d (4-6')	
Aluminum	2,760
Calcium	951 J
Iron	6,159 J
Magnesium	1,035 J
Manganese	135
Silicon	133 J

B20SB-2b (0.2-2')	
Aluminum	1,391
Calcium	185,275 *
Iron	2,509 J
Magnesium	5,577
Manganese	119

B20SB-2c (2-4')	
Aluminum	3,695
Calcium	198,017*
Iron	3,990 J
Magnesium	6,565
Manganese	133

B20SB-2d (4-6')	
Aluminum	3,695
Calcium	134,199 *
Cobalt	104 *
Iron	9,310 J
Magnesium	5,351
Manganese	238

B20SB-2e (6-8')	
Aluminum	5,280
Calcium	20,457
Iron	9,878 J
Magnesium	3,148 J
Manganese	792

LEGEND:

▲ SOIL BORING

MONITORING WELL

△ SOIL BORING/GRAB GROUND-WATER

NOTE:

(a) No analytes were detected in the grab ground-water sample.

(b) Results reported in milligrams per kilogram (mg/kg) unless noted otherwise.

* Indicates result exceeds most stringent criterion

J Estimated value

U Analyte not detected

(µg/kg) Microgams per kilograms

Boring locations are not to scale.

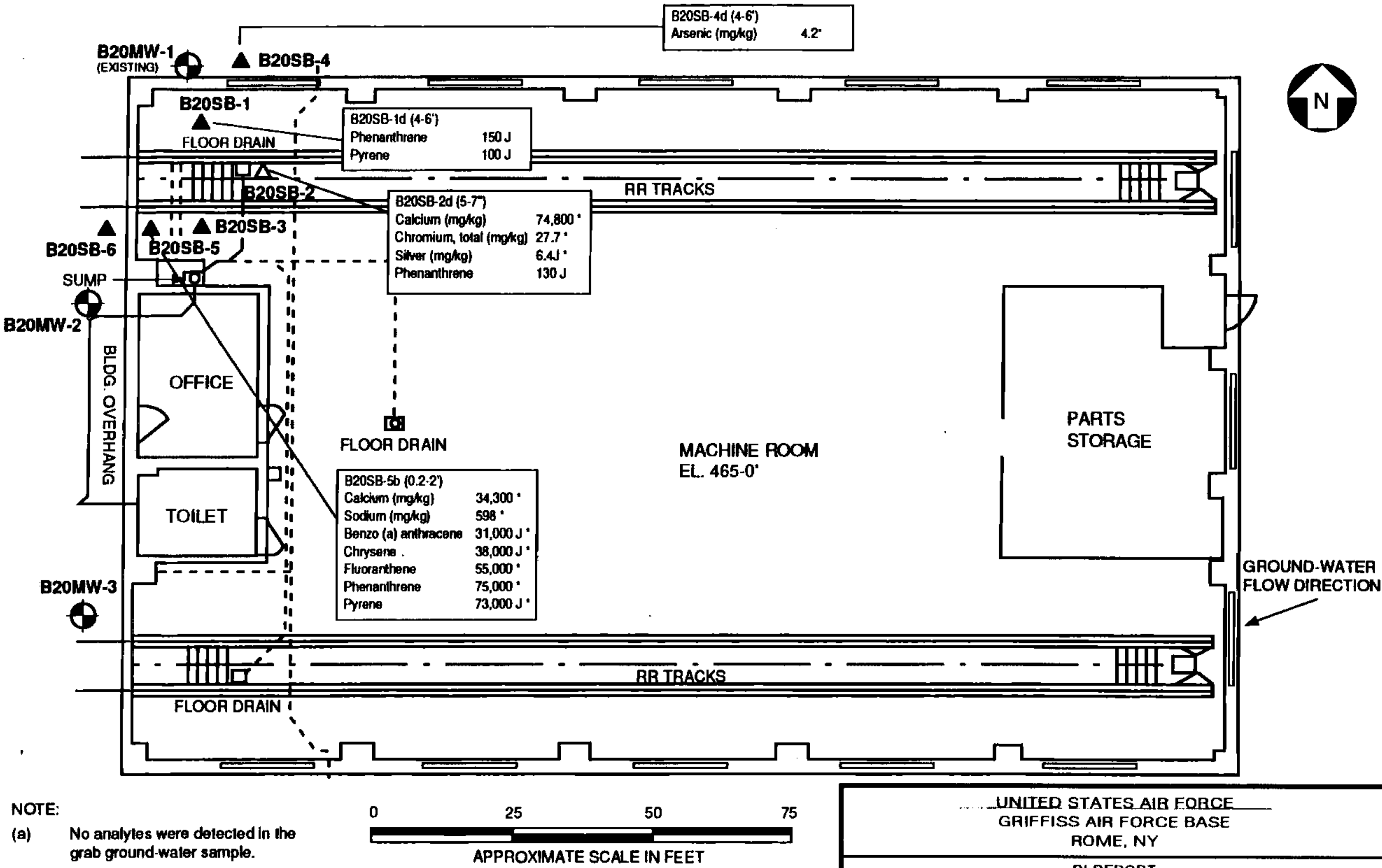
UNITED STATES AIR FORCE
GRIFFISS AIR FORCE BASE
ROME, NY

RI REPORT

LEVEL II FIELD SCREENING SAMPLING RESULTS
BUILDING 20 - LOCOMOTIVE ROUNDHOUSE SOIL BORINGS

PREPARED/DATE:	DSS / 24 JUL 95	FIGURE NUMBER:	4.1	FILE DATE:	07 AUG 95
CHECKED/DATE:	LAS / 10 AUG 95			PLOT DATE:	23 AUG 95
PROJECT NO.:	11-2588-0211			FILE NAME:	11-2588-0211.21

947 96



NOTE:

(a) No analytes were detected in the grab ground-water sample.

(b) Results reported in micrograms per kilogram (μg/kg) unless noted otherwise.

* Indicates result exceeds most stringent criterion

J Estimated value

U Analyte not detected

(mg/kg) Microgams per kilograms

Boring locations are not to scale.

LEGEND:

▲ SOIL BORING

⊕ MONITORING WELL

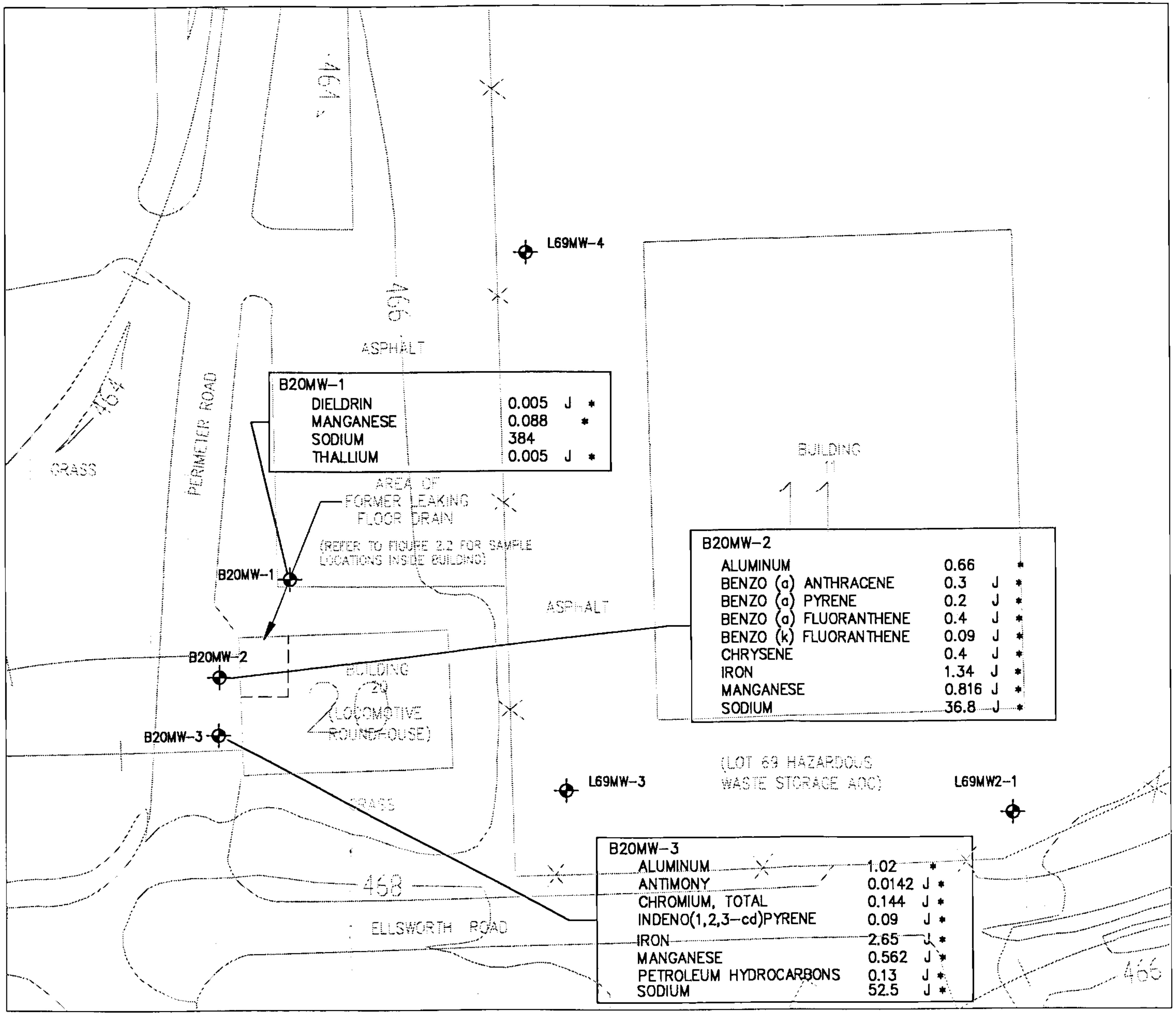
△ SOIL BORING/GRAB GROUND-WATER

UNITED STATES AIR FORCE
GRIFFISS AIR FORCE BASE
ROME, NY

RI REPORT

SELECTED SAMPLING RESULTS
BUILDING 20 - LOCOMOTIVE ROUNDHOUSE
SOIL BORINGS – CONFIRMATORY SAMPLES

PREPARED/DATE:	DSS / 24 JUL 95	FIGURE NUMBER:	FILE DATE:	07 AUG 95
CHECKED/DATE:	LAS / 10 AUG 95	4.2	PLOT DATE:	23 AUG 95
PROJECT NO.:	11-2588-0211		FILE NAME:	11-2588-0211.21



N

LEGEND:

- MONITORING WELL
- FENCE

0 50 100
SCALE IN FEET

TOPOGRAPHIC CONTOUR INTERVAL 2 FEET

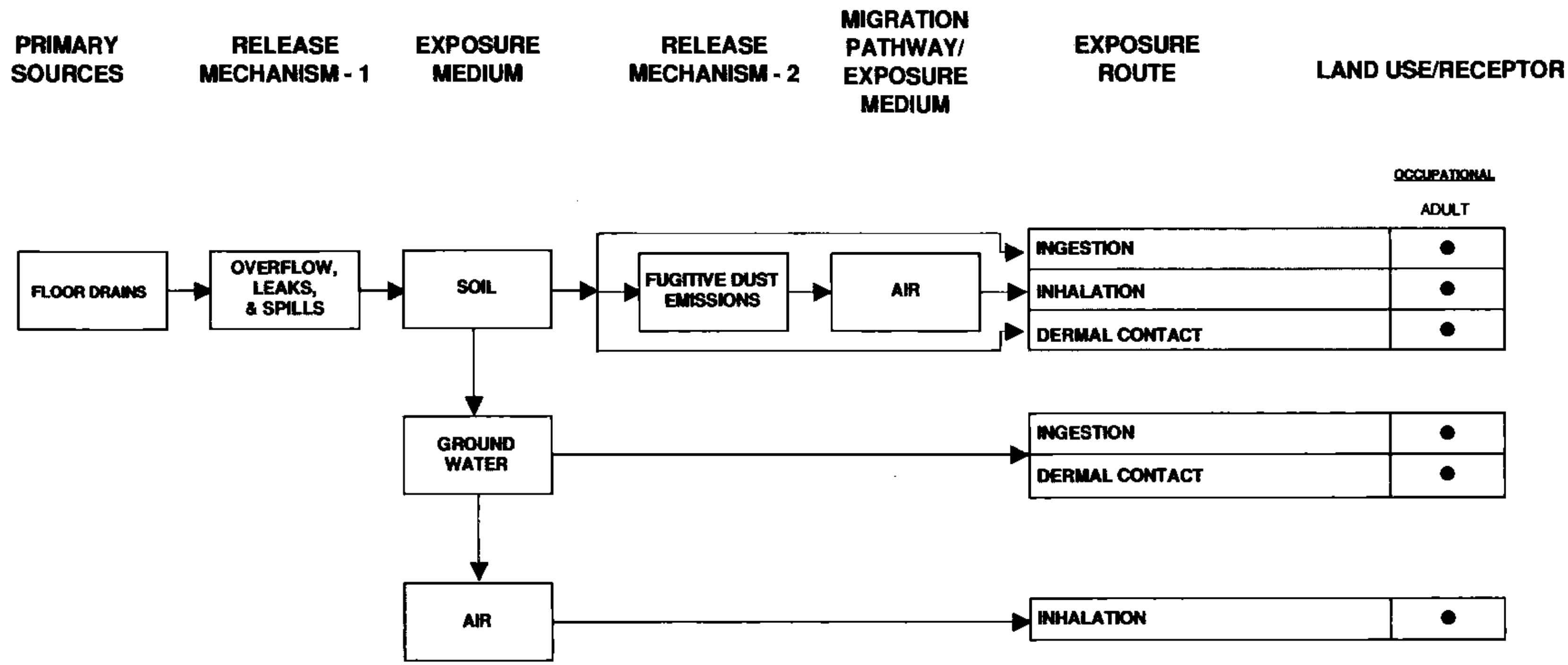
UNITED STATES AIR FORCE
GRIFFISS AIR FORCE BASE
ROME, NEW YORK

RI REPORT

SELECTED SAMPLING RESULTS GROUND-WATER

BUILDING 20 – LOCOMOTIVE ROUNDHOUSE

PREPARED BY/DATE: DSS 5/20/95	FIGURE NUMBER:	FILE DATE: 05.DEC.94	
CHECKED BY/DATE: KLA 5/25/95	4.3	PLOT DATE: 02.DECEMBER.96	
PROJECT NUMBER: 11-2588-0211		FILE NAME: 20LOCORH.DWG	



LEGEND

● EXPOSURES TO THESE RECEPTORS WILL BE QUANTIFIED FOR THIS AOC

DECEMBER 1994

UNITED STATES AIR FORCE
GRIFFISS AFB
ROME, NY

RI REPORT

CONCEPTUAL SITE MODEL
BUILDING 20

PREPARED/DATE:	TMS / 10 AUG 95	FIGURE NUMBER:	FILE DATE:	6 NOV 96
CHECKED/DATE	LAS / 20 AUG 95	6.1	PLOT DATE:	6 NOV 96
PROJECT No:	11-2588-0211		FILE NAME:	2588-0211.21

947 99

TAB

Appendix A

APPENDIX A

SOIL BORINGS - HTW DRILLING LOGS

Building 20 Locomotive Roundhouse

HTW DRILLING LOG

1. COMPANY NAME: Law Environmental, Inc.	2. DRILLING SUBCONTRACTOR: PARRATT Wolff	HOLE No. B20SB-1 / SHEET 1 OF 32 SHEETS
3. PROJECT: GAFB - RI 11-2588-0204	4. LOCATION (CITY, STATE): Rome, NY	
5. NAME OF DRILLER: Doug Richmond	6. MANUFACTURER'S DESIGNATION OF DRILL: Diedrich D-50	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6in Solid STEM Auger; 2in x 2ft Splitspoon	9. HOLE LOCATION (SITE): Building 20 - Locomotive Roundhouse	
	10. SURFACE ELEVATION: Boring inside building - Not Surveyed	
8. WEATHER: Clear Sunny	11. DATE STARTED: 6/20/94	12. DATE COMPLETED: 6/20/94
13. OVERBURDEN THICKNESS: N/A	16. DEPTH GROUNDWATER ENCOUNTERED: 6 ft.	
14. DEPTH DRILLED INTO ROCK: N/A	17. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —	
15. TOTAL DEPTH OF HOLE: 7.0'	18. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

19. GEOTECHNICAL SAMPLES (#)	DISTURBED	UNDISTURBED	20. TOTAL NUMBER OF CORE BOXES
None	—	—	N/A

21. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	22. TOTAL CORE RECOVERY%
MEA onsite screening						N/A

23. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	24. SIGNATURE OF INSPECTOR
Vertical	X	—	—	Jan [illegible]

25. CHECKED BY: D. Sanders
26. NAME OF INSPECTOR: [illegible] LAW Albany

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS (ppm) d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		Concrete ∅-1	N/A	N/A	NA	NA	1ft Concrete
	1.0	Loose Sl. cohesive Tan silty Fine to Med. SAND TR to Little Fine gravel	<1ppm in S.poon	#1 1-3'	Soil MEA	4/3 3/3 6	12/24R HNU 0ppm Downhole ground gas normal cond.
	2.0						
	3.0	Med. Dense non cohesive TAN TO Lt. Brown Silty Fine to Coarse SAND Little Fine to Med gravel (MOIST) Rock in Spoon POOR Recovery	<1ppm in spoon	#2 3-5	Soil MEA	3/5 6/5 11	2/24R
	4.0						
	5.0						

MRK FORM JUN 89 55 — PROJECT NAME & NO. GAFB - RI 11-2588-0204.04 — HOLE No. B20SB-1

HF — Rev. 4/94

HTW DRILLING LOG

HOLE No.	B20SB-1
PROJECT	GAFB - RI 11-2588-0204
INSPECTOR	IJG (LAW Albany)
SHEET	2 OF ~~3~~ 2 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS (ppm) d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
	5.0	Med. Dense Sl. cohesive TAN Silty Fine SAND TR to Little Fine gravel (SM)	<1 ppm in spoon	#3 5-7	Soil MEA	5/6 5/4 (11)	24/24 R
WATER	6.0	(wet)					
	7.0	Boring TERMINATED at 7 ft.					
	8.0	6.Ø WATER SATURATED Cond. at 6.Ø					
	9.0						
	10.0						
	11.0						
	12.0						
	13.0						
	14.0						

MRK FORM JUN 89 55-2 | PROJECT NAME & NO. GAFB - RI 11-2588-0204.~~04~~ | HOLE No. B20SB-1

HF — Rev. 4/94

HTW DRILLING LOG

HOLE No. B20SB-2	SHEET 1	OF 32 SHEETS
1. COMPANY NAME: Law Environmental, Inc.	2. DRILLING SUBCONTRACTOR: Parratt Wolff	
3. PROJECT: GAFB - RI 11-2588-0204	4. LOCATION (CITY, STATE): Rome, NY	
5. NAME OF DRILLER: Doug Richmond	6. MANUFACTURER'S DESIGNATION OF DRILL: Diedrich D-50	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6in Solid Stem Auger; 3in x 2ft Split Spoons	9. HOLE LOCATION (SITE): Building 20 - Locomotive Roundhouse	
	10. SURFACE ELEVATION: Boring inside building — Not Surveyed	
8. WEATHER: Clear Sunny	11. DATE STARTED: 6/20/94	12. DATE COMPLETED: 6/20/94
13. OVERBURDEN THICKNESS: N/A	16. DEPTH GROUNDWATER ENCOUNTERED: 7.5 Ft	
14. DEPTH DRILLED INTO ROCK: N/A	17. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —	
15. TOTAL DEPTH OF HOLE: 7.5'	18. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

19. GEOTECHNICAL SAMPLES (#)	DISTURBED	UNDISTURBED	20. TOTAL NUMBER OF CORE BOXES
None	—	—	N/A

21. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	22. TOTAL CORE RECOVERY%
Soil to ~~be~~ MEA for on site analysis						N/A

23. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	24. SIGNATURE OF INSPECTOR
Vertical	X	—	—	[signature]

25. CHECKED BY:	26. NAME OF INSPECTOR
D. Sanders	[signature] LAW Albany

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS (ppm) d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
Ø94Ø	0.0	Concrete	N/A	#1	Soil MEA	X/2/2/3	Ø ppm D. Hole Quad gas normal
	1.0	Loose GRAY silty sand AND GRAVEL (FILL)	<1 ppm in spoon	Ø.5-2			6 in R /24
	2.0	same as above 2-4'	N/A	#2 2-4	Soil MEA	1/WOH 1.5	6/24 R
	3.0						
	4.0	concrete 4-5 ft. BGS	N/A	N/A	N/A	N/A	Ø ppm Down hole Quad gas normal
	5.0						

HTW DRILLING LOG

PROJECT	INSPECTOR	HOLE No. / SHEET
GAFB - RI 11-2588-0204	IJG Law Albany	B20SB-2 / SHEET 2 OF 2 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS (ppm) d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
	5.0	stone fill					
		med. Dense. non cohesive, Silty Fine to med. TAN SAND little to some Fine/med. gravel moist) (SM)	<1ppm in Spoon	#3 5-7	Soil MEA	5/7 5/5 (12)	8/24R HNU Øppm downhole Quad gas Normal
	6.0						
WATER ▼ 7.5	7.0	Same as above (wet)	<1ppm in spoon	#4 7-9	Soil MEA	26/15 26/12 (41)	18/24R
	8.0						
	9.0	DROVE Hydropunch No Sample					
	10.0						
12:00 Finish	11.0						
	12.0	Boring TERMINATED No Refusal Saturated conditions at 7.5 ft					
	13.0						
	14.0						

MRK FORM JUN 89 55-2 PROJECT NAME & NO. GAFB - RI 11-2588-0204 HOLE No. B20SB-2

HF — Rev. 4/94

B20SB-3

HTW DRILLING LOG

1. COMPANY NAME: Law Environmental, Inc.	2. DRILLING SUBCONTRACTOR: Parratt Wolff	HOLE No. ~~[illegible]~~ SHEET 1 OF 2 SHEETS
3. PROJECT: 11-2588-0204	4. LOCATION (CITY, STATE): Rome NY	
5. NAME OF DRILLER	6. MANUFACTURER'S DESIGNATION OF DRILL: Diedrich D-50	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6in Solid Stem Auger; 3in x 2ft Split spoon	9. HOLE LOCATION (SITE): Building 20	
	10. SURFACE ELEVATION: Boring inside building - Not Surveyed	
8. WEATHER: Clear Sunny	11. DATE STARTED: 6/20/94	12. DATE COMPLETED: 6-20-94
13. OVERBURDEN THICKNESS: NA	16. DEPTH GROUNDWATER ENCOUNTERED: 6ft	
14. DEPTH DRILLED INTO ROCK: NA	17. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —	
15. TOTAL DEPTH OF HOLE: 9 ft	18. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

19. GEOTECHNICAL SAMPLES (#)	DISTURBED	UNDISTURBED	20. TOTAL NUMBER OF CORE BOXES
N/A	✓	—	NA

21. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	22. TOTAL CORE RECOVERY%
Soil to MEA for on site analysis						→

23. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	24. SIGNATURE OF INSPECTOR
abandoned ~~abin~~	✓	—	—	[signature]

25. CHECKED BY:	26. NAME OF INSPECTOR
D. Sanders	IJG LAW Albany

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS (ppm) d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		Concrete slab Floor	N/A	N/A	N/A	N/A	—
		GRAVEL FILL					
	1.0	Loose Non-cohesive TAN Silty Fine SAND TR. GRAVEL	<1ppm in Spoon	#1 .5-2	Soil MEA	2 3 3 (5)	10/24R HNU 0ppm Downhole Quad gas Normal
	2.0	Same as above 2-4	<1ppm in Spoon	#2 2-4	Soil MEA	4 4 5 4 (9)	10/24R HNU 0ppm Downhole Quad gas Normal
	3.0						
	4.0	Same as above 4-6 moist	<1ppm in Spoon	#3 4-6	Soil MEA	2 3 2 2 (5)	3/24R →

MRK FORM 55 JUN 89 | PROJECT NAME & NO. GAFB-RI 11-2588-0204 | HOLE No. B20SB-3

HF — Rev. 4/94

HTW DRILLING LOG

PROJECT GAFB-RI 11-2588-0204	INSPECTOR IJG LAW Albany	HOLE No. B20 SB-3	SHEET 2 OF 2 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS (ppm) d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
	5	See previous page for 4-6' Description	—	—	—	—	0ppm HNU Downhole & road gas Normal
WATER	6						
		Loose non-cohesive Tan silty Fine SAND TR. Fine GRAVEL (Wet) (SM)	<1ppm in Split Spoon	#4 6-8'	Soil MEA	2/3 5/7 8	12/24R
	7						
	8	Boring TERMINATED AT 8.0 ft. No Refusal saturated cond. at 6.0 ft.					

MRK FORM JUN 89 55-2 | PROJECT NAME & NO. GAFB-RI 11-2588-0204 | HOLE No B20 SB-3

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HTW DRILLING LOG

HOLE No.	B20SB-4
1. COMPANY NAME	Law Environmental, Inc.
2. DRILLING SUBCONTRACTOR	Parratt Wolff Inc.
SHEET	1 OF 2 SHEETS
3. PROJECT	Griffiss AFB-RI
4. LOCATION (CITY, STATE)	Rome, NY
5. NAME OF DRILLER	Brian Waters, Butch Stevens
6. MANUFACTURER'S DESIGNATION OF DRILL	CME-55
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4¼" I.D. hollow stem augers; 3" O.D. split spoons
9. HOLE LOCATION (SITE)	B20
10. SURFACE ELEVATION	Boring inside building - Not Surveyed
8. WEATHER	cloudy 78°
11. DATE STARTED	7/7/94
12. DATE COMPLETED	7/7/94
13. OVERBURDEN THICKNESS	~~NA~~ RR 7/7/94 3"
16. DEPTH GROUNDWATER ENCOUNTERED	~~3.5~~ RR 7/7/94 4.0'
14. DEPTH DRILLED INTO ROCK	NA
17. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
15. TOTAL DEPTH OF HOLE	8.0'
18. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

19. GEOTECHNICAL SAMPLES (#)	DISTURBED	UNDISTURBED	20. TOTAL NUMBER OF CORE BOXES
NA	✓		NA

21. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	22. TOTAL CORE RECOVERY%
B20SB-4B, B20SB-4C, B20SB-4D	VOA	Cr⁺⁶	BNA, PCB, TRPH	TAL Inorganics		NA

23. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	24. SIGNATURE OF INSPECTOR
Soil boring	✓	NA		[signature]

25. CHECKED BY:	26. NAME OF INSPECTOR
D. Sanders	Robert Ravagni

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS (ppm) d Time	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS Recovery Moisture
	0	Brown to olive grey fine slightly sandy slightly micaceous SILT w/ some small gravel (5mm) and a trace of clay in some spots. SM/ML 0-2'	11:00 0.0 ppm		B20SB-4B @ 0-2'	4,6 7,10	1.3 ft rec, Damp
	1.0						
	2.0	Brown silty fine to medium SAND 2-2.75' SM	11:05 0.0 ppm		B20SB-4C @ 2-4'	7,3 7,9	2.0 ft rec, Moist to wet
	3.0	Light grey fine slightly sandy SILT w/ trace of clay in some spots. ML 2.75-					
	4.0	Brown silty fine to medium SAND SM 4-4.66'					- H2O @ 4'
		Light brown fine slightly sandy SILT w/ trace of clay some spots ← ML 4.66-5.5'			RR 7/7/94		
	5.0						

PROJECT NAME & NO. Griffiss AFB-RI 11-2588-0205 HOLE No. B20SB-4

MRK Form 55

HTW DRILLING LOG

HOLE No. B20SB-4

PROJECT: Griffis AFB-RI

INSPECTOR: Robert Rangan

SHEET 2 OF 2 SHEETS

ELEV a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS (ppm) d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
	5.0	Light brown slightly sandy SILT w/ trace of clay in some spots. ML 4.66-5.5'	11:15 0.0 ppm		B20SB-4D @ 4-6'	10,10 13,14	1.79 ft rec. wet H_2O @ 4'
	6.0	Brown silty fine to medium SAND w/ some gravel (5-40mm) and trace of clay in some spots SM	11:20 0.0 ppm	No sample taken because into water table.		13,12 8,8	1.0 ft rec. wet
	7.0						
	8.0	B.T. @ 8.0'					

MRK FORM JUN 89 55-2

PROJECT NAME & NO: Griffis APB-RI 11-2588-0204

HOLE No. B20SB-4

HF — Rev. 4/94

HTW DRILLING LOG

HOLE No. B205B-5

1. COMPANY NAME: Law Environmental, Inc.	2. DRILLING SUBCONTRACTOR: Paratt Wolff Inc.
SHEET 1 OF 2 SHEETS	
3. PROJECT: Griffis AFB-RI	4. LOCATION (CITY, STATE): Rome, NY
5. NAME OF DRILLER: Joe Percy	6. MANUFACTURER'S DESIGNATION OF DRILL: D-50 Diedrich
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6" O.D. Solid Stem augers	9. HOLE LOCATION (SITE): B20
	10. SURFACE ELEVATION: Boring inside building - Not Surveyed
8. WEATHER: Sunny 80°	11. DATE STARTED: 7/5/94 — 12. DATE COMPLETED: 7/5/94
13. OVERBURDEN THICKNESS: NA	16. DEPTH GROUNDWATER ENCOUNTERED: 7.25'
14. DEPTH DRILLED INTO ROCK: NA	17. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA
15. TOTAL DEPTH OF HOLE: 8.5	18. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA

19. GEOTECHNICAL SAMPLES (#)	DISTURBED	UNDISTURBED	20. TOTAL NUMBER OF CORE BOXES
NA	✓		NA

21. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	22. TOTAL CORE RECOVERY%
B205B-5B, B205B-5C, B205B-5D, B205B-5E	VOA	Cr-6	BNA, PCB, TRPH	TAL Inorganics		NA

23. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	24. SIGNATURE OF INSPECTOR
Soil boring	✓	NA		[signature]

25. CHECKED BY: D. Sandrea

26. NAME OF INSPECTOR: Robert Ravagni

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS (ppm) d Time	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	Recovery REMARKS h Moisture
	0	Concrete 0-0.50'					
	1.0	Brown slightly fine sandy SILT w/ some rounded gravel (30 mm - 10 mm) SM to SM/GM @ 0.5-2.5'	14:20 0ppm		B205B-5B @ 0.5-2.5'	11, 8, 8, 6	1.5' ft rec, moist
	2.0						
	3.0	Brown slightly fine sandy SILT SM 2.5-4.35'	14:23 0ppm		B205B-5C @ 2.5-4.5	3, 7, 10, 12	2.0 ft rec, dry
	4.0	Brown silty fine to medium SAND SM 4.35'-4.5					moist @ 4.35'
	5.0	Brown slightly fine sandy SILT SM 4.5-5.0'					

HTW DRILLING LOG

HOLE No.	SHEET
B20SB-5	2 OF 2 SHEETS

PROJECT: Griffiss AFB-RI

INSPECTOR: Robert Raragni

ELEV a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS (ppm) Time d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	Recovery REMARKS Moisture
	5.0	Brown silty fine to medium SAND SM 5-6.5'	14:45 0ppm		B5B20-5D @ 4.5-6.5	8,9 6,8	2.0 Ft rec, Damp
	6.0						
							1.15 Ft rec RR 7/5/94 ~~2.0 Ft rec~~
	7.0	Brown silty fine to medium SAND w/ subrounded to rounded gravel (10-50 mm) GM/SM 6.5-8.5'	15:50 0ppm		B5B20-5E @ 6.5-8.5	8, 6 10, 12	H_2O @ 7.25 wet
	8.0						
		8.5' B.T. @ 8.5'					
	9.0						

MRK FORM JUN 89 55-2

PROJECT NAME & NO. Griffiss AFB-RI 11-2588-0204

HOLE No. B20SB-5 ~~B5B 2~~ RR 7/5/94

HTW DRILLING LOG

1. COMPANY NAME: Law Environmental, Inc.	2. DRILLING SUBCONTRACTOR: Parratt Wolff Inc.	HOLE No. B20SB-6; SHEET 1 OF 2 SHEETS
3. PROJECT: Griffis AFB-RI	4. LOCATION (CITY, STATE): Rome, NY	
5. NAME OF DRILLER: Joe Percy	6. MANUFACTURER'S DESIGNATION OF DRILL: Diedrich (D-50)	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6" O.D. Solid Stem augers	9. HOLE LOCATION (SITE): B-20	
	10. SURFACE ELEVATION: Boring inside building - Not Surveyed	
8. WEATHER: cloudy to sunny 80°	11. DATE STARTED: 7/5/94	12. DATE COMPLETED: 7/5/94
13. OVERBURDEN THICKNESS: NA	16. DEPTH GROUNDWATER ENCOUNTERED: 6.85'	
14. DEPTH DRILLED INTO ROCK: NA	17. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
15. TOTAL DEPTH OF HOLE: 8.75'	18. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

19. GEOTECHNICAL SAMPLES (#)	DISTURBED	UNDISTURBED	20. TOTAL NUMBER OF CORE BOXES
NA	✓		NA

21. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	22. TOTAL CORE RECOVERY%
B-20SB-6B, B-20SB-6C	VOA	Cr-6	BNA, PCB, TRPH	TAL Inorganics		NA

23. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	24. SIGNATURE OF INSPECTOR
Soil boring	✓	NA		[signature]

25. CHECKED BY: D. Sandra

26. NAME OF INSPECTOR: Robert Ravigni

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS (ppm) d Time	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	Recovery REMARKS h Moisture
Ground	0	This is a trench		Ground			Top of railroad tracks @ 0.0 ft.
	1.0	Air - This area is in a pit (trench) for the railroad engines to be worked on.					
	2.0						
	3.0	3.75' Top of Concrete surface below railroad tracks (trench)					
	4.0	Concrete w/rebar 3.75-4.75'					
	5.0	Brown fine sandy SILT SM	13:28 0ppm		B20SB-6B @ 4.75-6.75	2,2 4,8	2 feet rec, moist

MRK FORM 55 | PROJECT NAME & NO. Griffis AFB-RI 11-2588-0204 | HOLE No. B20SB-6

HTW DRILLING LOG

HOLE No.
B20SB-6

PROJECT	INSPECTOR	SHEET
Griffis AFB-RI	Robert Ravagni	2 OF 2 SHEETS

ELEV a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS (ppm) d Time	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	Recovery REMARKS h Moisture
	5.0	Brown fine sandy SILT SM 4.75-6.5					
	6.0						
		Brown to gray silty fine to medium SAND SM 6.5-6.85'					
	7.0	Light brown silty fine to medium SAND w/ rounded gravel (40mm) GM/SM	13:40 0ppm		B20SB-6C @ 6.75-8.75'	8,12 5,5	0.75 ft rec, H_2O @ 6.85' wet
	8.0						
	9.0	B.T. @ 8.75 ft					

MRK FORM 55-2

PROJECT NAME & NO. Griffis AFB-RI 11-2588-0204

HOLE No. B20SB-6

TAB

Appendix B

APPENDIX B

MONITORING WELLS - HTW DRILLING LOGS
WELL INSTALLATION DIAGRAMS AND WELL DEVELOPMENT DATA

Building 20 Locomotive Roundhouse

HTW DRILLING LOG

HOLE No. 520 MW-2

1. COMPANY NAME: Law Environmental, Inc.	2. DRILLING SUBCONTRACTOR: PARRATT WOLFF	SHEET 1 OF 3 SHEETS
3. PROJECT: GAFB RI 11-2588-0204	4. LOCATION (CITY, STATE): Rome NY	
5. NAME OF DRILLER: Dona Richmond	6. MANUFACTURER'S DESIGNATION OF DRILL: Diedrich D-50	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 1/4 ID HSA 4 Rubi; TRI cone plug; 2in x 2ft split spoons	9. HOLE LOCATION (SITE): outside Building 20	
	10. SURFACE ELEVATION: 465.43	
8. WEATHER: Clear cool sunny	11. DATE STARTED: 5/27/94	12. DATE COMPLETED: 5/27/94
13. OVERBURDEN THICKNESS: NA	16. DEPTH GROUNDWATER ENCOUNTERED: 8.5 BGS	
14. DEPTH DRILLED INTO ROCK: NA	17. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
15. TOTAL DEPTH OF HOLE: 20 ft. BGS	18. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 7.28 6/21/94	

19. GEOTECHNICAL SAMPLES (#)	DISTURBED	UNDISTURBED	20. TOTAL NUMBER OF CORE BOXES
6 samples	✓	—	—

21. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	22. TOTAL CORE RECOVERY%
NA	—	—	—	—	—	—

23. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	24. SIGNATURE OF INSPECTOR
vertical	—	✓	—	Ian J. Grassie

25. CHECKED BY:	26. NAME OF INSPECTOR
DSS 6-17-94	~~LJT~~ Ian Albany Ian Grassie

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS (ppm) d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		Black top	Headspace 0-2 <1 ppm	#1 0-2'	NA	X/8 6/5 (14)	24/24R 0ppm Downhole Quad gas Normal
	1.0	Med. Dense Non cohesive Brown Silty SAND ~~AD~~ Little gravel (FILL) (Dry/damp) (SM)					
	2.0	Loose Lt Brown Sl. cohesive silty FINE SAND TR. Fine gravel (Damp)(SM)(FILL)	Headspace 2-4 1-2 ppm	#2 2-4	NA	8/5 4/3 (9)	12/24R 0ppm D.Hole Quad gas Normal
	3.0						
	4.0	SAme AS ABove 4-6 (Dry/Damp) (SM)	Headspace 4-6' 1-2 ppm	#3 4-6	NA	8 6 7/5 (13)	5/24R

MRK FORM JUN 89 55 PROJECT NAME & NO. GAFB-RI 11-2588-0204 HOLE NO. B20 MW-2

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HTW DRILLING LOG

PROJECT	INSPECTOR	HOLE No.	SHEET
GAFB - RI 11-2588-0204	~~EJG~~ Lou Athey / Ian Greene	B20MW2	2 OF 3 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS (ppm) d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
	5	See previous page for 5-6' ft. Description (SM)					
	6	same as above 6-8' (SM) (Damp/Moist)	H.Spoon 6-8' 1-2ppm	#4 6-8'	NA	10/8 6/6 (14)	12/24R 0ppm Downhole Quad gas Normal
	7						
wet	8	WATER lgt. brown Med. Dense NONE Cohesive F/m/c SAND Little to some F/m Gravel (wet) (SM)	H.Spoon 8-10' 1-2ppm	#5 8-10	NA	11/11 9/18 (20)	15/24R 0ppm Downhole Quad gas Normal
	9						
	10	10-14' ABGS NO sample					
	11						
	12						
	13						
	14						

HTW DRILLING LOG

PROJECT	INSPECTOR	HOLE No.	SHEET
GAFB-RI 112588 0264	~~IJG~~ Ian Grassie LAW Albany	B20MW-2	SHEET 3 OF 3 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS (ppm) d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		14-15ft. BGS No sample					
	15	Same as ~~above~~ 8-10' (SM) (wet)	H.Space 15-17 1-2ppm	#6 15-17	NA	11/11 9/6 19	24/24R 0ppm Downhole Quad Gas Normal
	16						
	17	17-20ft. BGS No Sample					
	18						
	19						
	20	Boring terminated 20 ft BGS					

MRK FORM JUN 89 55-2

PROJECT NAME & NO. GAFB-RI 112588-0264

HOLE No. B20MW-2

B20MW-3

HTW DRILLING LOG

1. COMPANY NAME: Law Environmental, Inc.	2. DRILLING SUBCONTRACTOR: PARRATT WOLFF	HOLE No. B20 MW3; SHEET 1 OF 3 SHEETS
3. PROJECT: GAFB - RI 11 2588 0204	4. LOCATION (CITY, STATE): Rome NY	
5. NAME OF DRILLER: Doug Richmond	6. MANUFACTURER'S DESIGNATION OF DRILL: Mobile B-58	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 1/4 HSA H.Duty; TRI-cone Plug; 3in x 2ft Split Spoons	9. HOLE LOCATION (SITE): Building 20	
	10. SURFACE ELEVATION: 465.34	
8. WEATHER: Sunny WARM 65°	11. DATE STARTED: 5/27/94	12. DATE COMPLETED: 5/27/94
13. OVERBURDEN THICKNESS: N/A	16. DEPTH GROUNDWATER ENCOUNTERED: 8 ft BGS	
14. DEPTH DRILLED INTO ROCK: N/A	17. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
15. TOTAL DEPTH OF HOLE: 28 ft BGS	18. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 7.38 6/21/94	

19. GEOTECHNICAL SAMPLES (#)	DISTURBED	UNDISTURBED	20. TOTAL NUMBER OF CORE BOXES
6 Samples	✓		

21. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	22. TOTAL CORE RECOVERY%
—	—	—	—	—	—	—

23. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	24. SIGNATURE OF INSPECTOR
vertical	—	✓	—	[signature]

25. CHECKED BY: DSS 6-17-94	26. NAME OF INSPECTOR: Ian Grassie

ELEV a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS (ppm) d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
	0	Black Top					
		Med. Dense Non cohesive Brown F/M SAND little F/M/C Gravel (SM) Fill	Headspace 0-2' 1-2 ppm	#1 0-2	NA	X/11 11/9 (22)	5/24 R 0 ppm Downhole Quad gas Normal
	1.0						
	2.0						
		Same as above 2-4' (SM)	H. Space 2-4 1-2 ppm	#2 2-4'	NA	7/9 14/20 (23)	6/24 R 0 ppm Downhole Quad gas normal
	3.0						
	4.0	No sample —	H. Space 4-6' 1-2 ppm	#3 4-6	NA	32/50/.4	NR

MRK FORM 55 JUN 89 | PROJECT NAME & NO: GAFB-RI 11-2588-0204 | HOLE No. B20 MW-3

HTW DRILLING LOG

HOLE No. B20MW-3 ~~B20 MW3~~

PROJECT: CAFB RI- 112588 0204

INSPECTOR: [illegible]

SHEET 2 OF 3 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS (ppm) d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
	5	See previous page for 4-6 ft. Description - No Sample					
	6	Med. Dense SL. Coloured Brown Silty Fine SAND TR. to Little F/M gravel (Damp to moist) (SM)	H. Space 6-8' 1-2 ppm	#4 6-8	NA	11/12 9/12 (21)	5/24 R Φ ppm Downhole Guadgas Normal
	7						
	8	Same as Above (SM)	H. Space 8-10 1-2 ppm	#5 8-10	NA	12/24 18/4	18/24 R Φ ppm Downhole Guadgas Normal
	9						
	10	wet at 8.0					
		10 - 14 ft. BGS No Sample					
	11						Φ ppm HNu Reading Downhole
	12						
	13						
	14						

MRK FORM JUN 89 55-2

PROJECT NAME & NO. CAFB - RI 112588 0204

HOLE No. B20 MW-3

HTW DRILLING LOG

PROJECT	INSPECTOR	HOLE No.	SHEET
GAFB-RI 11258800204	[illegible]	B-20 MW-3	SHEET 2 OF 3 SHEETS

ELEV a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS (ppm) d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
	14	14-15 Ft. BGS No sample	Headspace 15-17' 1-2 ppm				
	15	Med. Dense Sl. Cohesive silty: Fine to med SAND Little Fine to Med Gravel (Wet) (SP)		[illegible] 15	NA	10/12 18/21 (30)	24/24R ∅ppm Downhole [illegible] Normal
	16						
	17	17-20 Ft No sample					
	18						
	19						
	20	BORING TERMINATED No Refusal Water at 8 ft. BGS					
	21						
	22						
	23						

MRK FORM JUN 89 55-2

PROJECT NAME & NO.	HOLE No.
GAFB-RI 11-2588-0204	B20MW-3

947 122

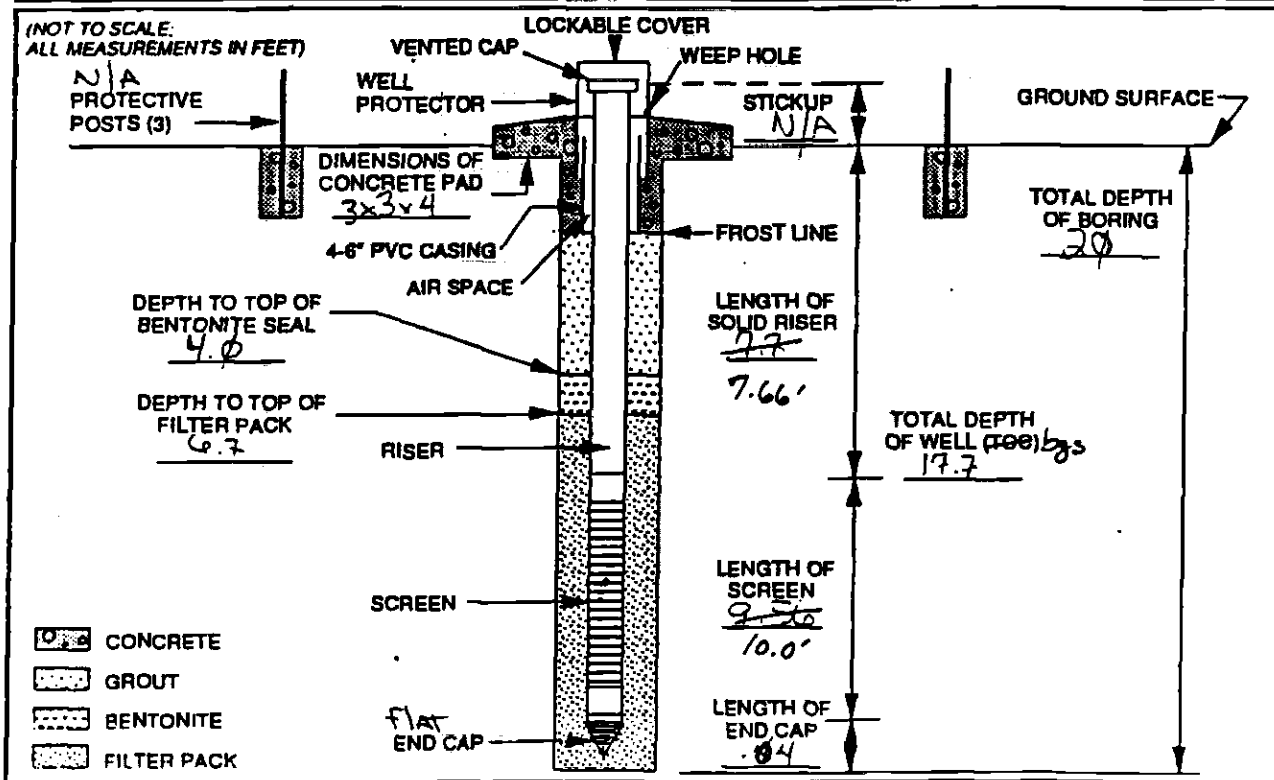
TYPE II MONITORING WELL INSTALLATION DIAGRAM

PROJECT NAME GAFB - RI PROJECT NO. 11-2588-Ø2Ø4
WELL NO. ~~B2Ø MW-2~~ B2ØMW-2 WELL LOCATION Building 2Ø
DATE 5/27/94 TIME 7:ØØ

~~GROUND~~ Concrete SURFACE ELEVATION 465.43
TOP OF SCREEN ELEVATION 547.43
REFERENCE POINT ELEVATION 465.99 ~~Ground Surface~~
TYPE FILTER PACK WASHED SILICA GRADATION 20/40 #Ø
FILTER PACK MANUFACTURER Morie
SCREEN MATERIAL PVC
MANUFACTURER Diedrich
SCREEN DIAMETER 2in SLOT SIZE Ø.Ø1Ø
RISER MATERIAL PVC
MANUFACTURER Diedrich
RISER DIAMETER 2in
DRILLING TECHNIQUE 4 1/4 I.D. HSA H.Duty
AUGER/BIT SIZE AND TYPE 8in O.D. H.Duty

BENTONITE TYPE Med. Angular Chips
MANUFACTURER Wyo-Ben
CEMENT TYPE N/A
MANUFACTURER N/A
BOREHOLE DIAMETER 8in
LAW ENVIRONMENTAL, INC. FIELD REPRESENTATIVE Ian Grassie ~~IJG Law Albany~~
DRILLING CONTRACTOR PARRATT WOLFF
AMOUNT BENTONITE USED 1 bag x 5Ø lbs ea
AMOUNT CEMENT USED N/A
AMOUNT SAND USED 45 Bags x 5Ø lbs ea
STATIC WATER LEVEL (> 24 hrs. after dev.) 7.28
MEASURED ON (Date/Time) 6/21/94 @ 1035

REMARKS well finished as a flush mount w/ no protective post



QA / QC	DRILLER: Doug Richmond	INSPECTOR: ~~IJG Law Albany~~ Ian Grassie
	DISCREPANCIES:	CHECKED BY: D. Sanders DATE: 6-17-94

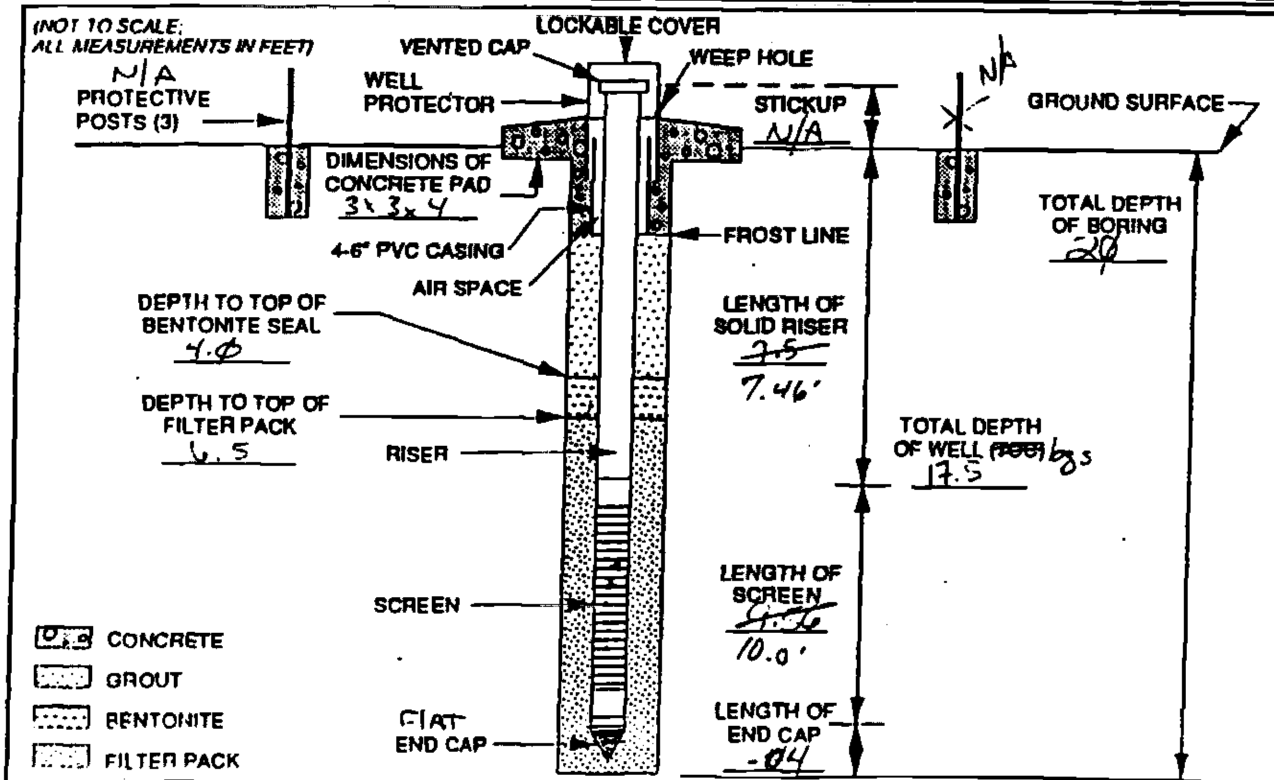
Type II FP — Rev. 4/94

TYPE II MONITORING WELL INSTALLATION DIAGRAM

PROJECT NAME GAFB - RI PROJECT NO. 11-2588-0204
WELL NO. ~~B20 MW3~~ B20MW-3 WELL LOCATION Building 20
DATE 5/27/94 TIME 17:00

~~GROUND~~ Concrete SURFACE ELEVATION 465.34
TOP OF SCREEN ELEVATION 457.56
REFERENCE POINT ELEVATION ~~Ground Surface~~ 465.92
TYPE FILTER PACK WASHED SILICA GRADATION 20/40
FILTER PACK MANUFACTURER Unimin (40)
SCREEN MATERIAL PVC
MANUFACTURER Diedrich
SCREEN DIAMETER 2in SLOT SIZE 0.010
RISER MATERIAL 2in PVC
MANUFACTURER Diedrich
RISER DIAMETER 2inch
DRILLING TECHNIQUE 4 1/4 ID HSA H. Duty
AUGER/BIT SIZE AND TYPE 8in OD HSA
REMARKS Well finished as flush mount w/No protective posts

BENTONITE TYPE Med. Angular Chips
MANUFACTURER Wyo-Ben
CEMENT TYPE N/A
MANUFACTURER N/A
BOREHOLE DIAMETER 8in
LAW ENVIRONMENTAL, INC. FIELD REPRESENTATIVE ~~IJG LAW (Albany)~~ Ian Grassie
DRILLING CONTRACTOR PARRATT WOLFF
AMOUNT BENTONITE USED 1 bag of Bent. x 50lbs
AMOUNT CEMENT USED N/A
AMOUNT SAND USED ~~4.5~~ 5.0 bags x 50lbs
STATIC WATER LEVEL (> 24 hrs. after dev.) 7.38
MEASURED ON (Date/Time) 9/21/94 @ 1111



QA / QC DRILLER: Doug Richmond INSPECTOR: ~~IJG LAW (Albany)~~ Ian Grassie
DISCREPANCIES: CHECKED BY: D Sanders DATE: 6-17-94

Type II FP — Rev. 4/94

WELL DEVELOPMENT DATA

PROJECT NAME GAFB PROJECT No. 1125880204

DEVELOPED BY J. ZAHN
DAVE DORCHEUS
CHECKED BY D. Sanders SHEET 1 OF 2

1. Well No.: B20 MW-3 Site Location: Building 20, Railroad engine house
2. Date of Installation: 5/27/94
3. Date of Development: 6/20/94
4. Static Water Level: Before Development 7.27 ft.; At Least 24 hrs. After 7.38 ft.
5. Organic Vapor: Before Development 1.1 ppm; After Development 0.3 ppm
6. Quantity of Water Loss During Drilling, If Used: 0.0 gal.
7. Quantity of Standing Water in Well and Annulus Before Development: $2.55 \times 10 \cong 25.5$ gal.
8. Depth From Top of Well Casing to Bottom of Well: 17.5 ft. (from Well Installation Diagram)
9. Well Diameter: 2" PVC. in.
10. Screen Length: 9.56 ft.
11. Minimum Quantity of Water to be Removed: 46.4 gal.
12. Depth to Top of Sediment: Before Development 17.27 ft.; After Development 17.27 ft.
13. Physical Character of Water (Before/After Development): chocolate brown silt.
14. Type and Size of Well Development Equipment: 7x168" PVC QED Development pump. (compressor + wizard)
15. Description of Surge Technique, If Used: Surge with pump in well for Approx 30 minutes with 5 minute surge intervals.
16. Height of Well Casing Above Ground Surface: None, Flush mount ft. (from Well Installation Diagram)
17. Quantity of Water Removed: 92. gal. Time for Removal: 2H 07Min hr. / min.
18. 1-Liter Water Sample Collected: 1111 (Time) Photographed? Y / N
19. Final Turbidity in Nephelometric Units: 22.0 NTUs
20. Final Imhoff Cone Measurements < 0.75 mL/L, If Applicable: ——

HF — Rev. 4/94

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WELL DEVELOPMENT DATA
(Continued)

PROJECT NAME GAFB PROJECT No. 1125880204

DEVELOPED BY DD + JL CHECKED BY D. Sanders SHEET 2 OF 2

Well No.: B20MW-3 Site Location: Building 20

Date/ Time	Hrs. Dev./ Cum. Hrs. Dev.	Gals. Purged/ Cum. Gals. Purged	pH	Temp.	Cond. uS/cm	NTUs	Remarks
6/20 0902	← Begin	pumping →					
0906	0.07/0.07		7.79	63.1°F	807	>1000	
0916	0.17/0.2	10gallons					10gallons (0920)
0920	0.07/0.3		8.07	63.0	794	>1000	
0928	0.13/0.4		7.34	62.5	933	>1000	
0929	0.02/0.45	10/20gallons					
0936	0.12/0.57		7.15	62.6	938	>1000	
0942	0.1/0.7	10/30gal					
0943	0.02/0.68		7.06	62.9	927	>1000	
1007	0.4/1.1	20/50gallons					
1024	0.28/1.4		7.33	62.2	699	w/ surge >1000	
1040	0.27/1.63	20/70gal					
1050	0.17/1.8		7.66	62.6	1012	45	
1057	0.12/1.92	15/85g					
1107	0.17/~~2~~ 2.08		7.79	62.3	1006	22	
1111	2H 09min	7/92g				22	collect water sample

END development before 4 Hours as long as NTUs are met, surge time, volume removed are met. Masoud Zaman approved this on 4th shift

HF — Rev. 4/94

WELL DEVELOPMENT DATA

PROJECT NAME GAFB PROJECT No. 1125F8C207

DEVELOPED BY Jesse Zahn/Dave Dorchous CHECKED BY D. Sanders SHEET 1 OF 2

1. Well No.: B20MW-2 . Site Location: Building 20, Railroad engine Building
2. Date of Installation: 5/27/94
3. Date of Development: 6/20/94
4. Static Water Level: Before Development 7.37 ft.; At Least 24 hrs. After 7.28 ft.
5. Organic Vapor: Before Development 1.2 ppm; After Development 0.3 ppm
6. Quantity of Water Loss During Drilling, If Used: 20.0 gal.
7. Quantity of Standing Water in Well and Annulus Before Development: 2.55 x 10 ft ≅ 25.5 gal.
8. Depth From Top of Well Casing to Bottom of Well: 17.7 ft. (from Well Installation Diagram)
9. Well Diameter: 2" pvc in.
10. Screen Length: 9.56 ft.
11. Minimum Quantity of Water to be Removed: 86.4 gal.
12. Depth to Top of Sediment: Before Development ~~17.7~~ 17.25 ft.; After Development ~~17.7~~ 17.28 ft.
13. Physical Character of Water (Before/After Development): chocolate Brown silt
14. Type and Size of Well Development Equipment: 7' x 1.68" PVC QED Development pump. (compressor/wizard)
15. Description of Surge Technique, If Used: Surge with pump in well for Appox 45 min at ≃ 5 min each interval.
16. Height of Well Casing Above Ground Surface: Flush mount (none) ft. (from Well Installation Diagram)
17. Quantity of Water Removed: ~~65~~ 92.5 gal. Time for Removal: ~~1.25~~ 2H 08min hr./min.
18. 1-Liter Water Sample Collected: 1035 (Time) Photographed? Y / N
19. Final Turbidity in Nephelometric Units: 14.0 NTUs
20. Final Imhoff Cone Measurements < 0.75 mL/L, If Applicable: ——

HF — Rev. 4/94

WELL DEVELOPMENT DATA
(Continued)

PROJECT NAME GAFB PROJECT No. 112588020Y

DEVELOPED BY DD + JT CHECKED BY D. Sanders SHEET 2 OF 2

Well No.: B20MW-2 Site Location: Building 20

Date/ Time	Hrs. Dev./ Cum. Hrs. Dev.	Gals. Purged/ Cum. Gals. Purged	pH	Temp.	Cond.	NTUs	Remarks
6/20/94 0902	← Begin pumping →						
0906	0.07\0.07		7.70	65.2	652	>1000	
0909	0.12\0.12	5 gallons					
0928	0.43\0.43		7.53	64.4	689	>1000	
0934	0.53\0.53	20/25 gal					
0936	0.56\0.57		7.61	63.4	553	>1000	
0948	0.77\0.77	10/35 g					
1002	0.23 ~~1.0~~\1.0		7.78	64.5	840	>1000	
1024	0.43 ~~1.4~~\1.4		7.37	64.0	687	66	
1040	0.43\1.6	35/70 g	7.45	63.5	709	14.0	
1111	0.52 2H09MIN						End Development

HF — Rev. 4/94

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TAB

Appendix C

APPENDIX C

GEOTECHNICAL ANALYTICAL RESULTS

Building 20 Locomotive Roundhouse

LAW ENVIRONMENTAL, INC.
300 CHASTAIN CNTR BLVD, SUITE 315
KENNESAW, GEORGIA 30144
404-425-7879

PARTICLE SIZE DISTRIBUTION & PHYSICAL PROPERTIES

CLIENT Government Services

CLIENT JOB NO./PO#

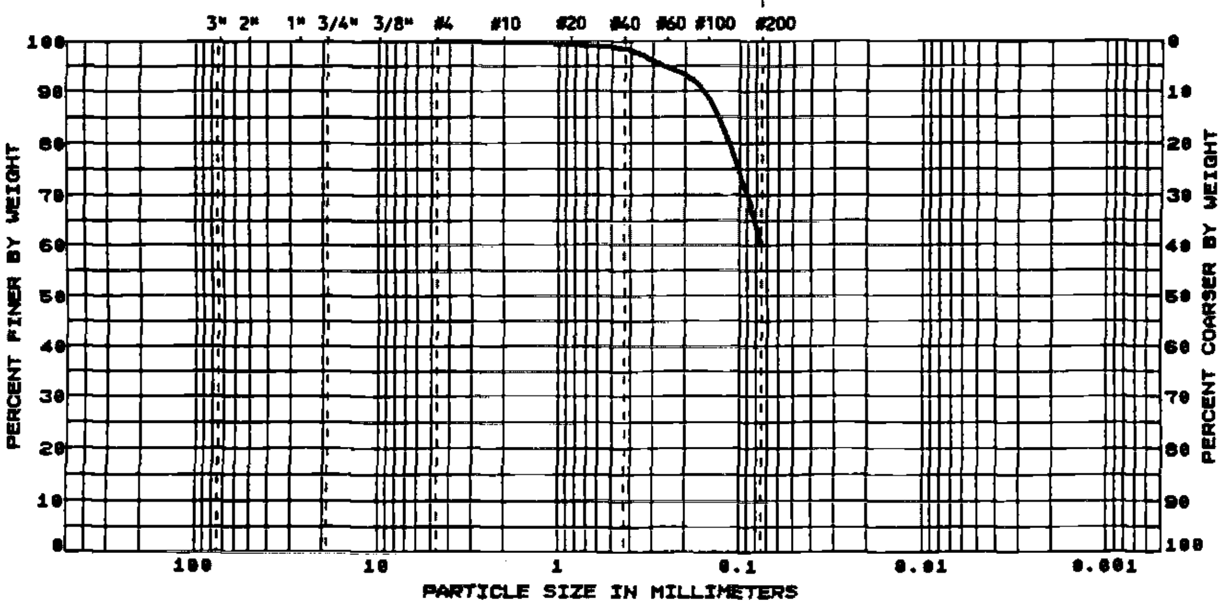
JOB NO. 11-2588-0204Tsk000 DATE July 1, 1994

LAB NO. 04389 PAGE 7

PROJECT Griffiss AFB - RI

SAMPLE ID B20MW-2B 2-4'

U.S. STANDARD SIEVE SIZES — HYDROMETER ANALYSIS



COBBLES	GRAVEL		SAND			SILT & CLAY
	COARSE	FINE	CO.	MEDIUM	FINE	

SIEVE NO.	SIEVE SIZE (MILLIMETERS)	*PERCENT PASSING	HYDROMETER PARTICLE DIAMETER (MILLIMETERS)
3"	75		0.050
2"	50		0.020
1-1/2"	37.5		0.005
1"	25		0.002
3/4"	19		0.001
1/2"	12.5		
3/8"	9.5		
No.4	4.75	100.0	
No.10	2.00	99.8	
No.20	0.850	99.3	
No.40	0.425	98.6	
No.60	0.250	94.9	
No.100	0.150	89.2	
No.200	0.075	60.0	

*REMARKS: TABULATED HYDROMETER VALUES ARE COMPUTER INTERPOLATED FROM A LINEAR DATA PLOT. PLOTTED VALUES MAY BE MORE ACCURATE FOR THE 0.050 mm PARTICLE DIAMETER.

TESTED BY: SC JM MO

TOTAL POROSITY (%)
EFFECTIVE SIZE (mm)
COEFFICIENT OF UNIFORMITY
COEFFICIENT OF CURVATURE
LIQUID LIMIT NP
PLASTIC LIMIT NP
PLASTICITY INDEX NP
CLASSIFICATION SANDY SILT (ML)

WATER CONTENT (%) 17.9
DRY DENSITY (PCF)
SPECIFIC GRAVITY OF SOLIDS
HYDRAULIC CONDUCTIVITY (cm/sec - 20C)
TEST PROCEDURES: ASTM D422, D2216, D4318, D2487.

LAW ENVIRONMENTAL, INC.

M.A. O'Kelley

LAW ENVIRONMENTAL, INC.
300 CHASTAIN CNTR BLVD, SUITE 315
KENNESAW, GEORGIA 30144
404-425-7879

PARTICLE SIZE DISTRIBUTION & PHYSICAL PROPERTIES

CLIENT Government Services

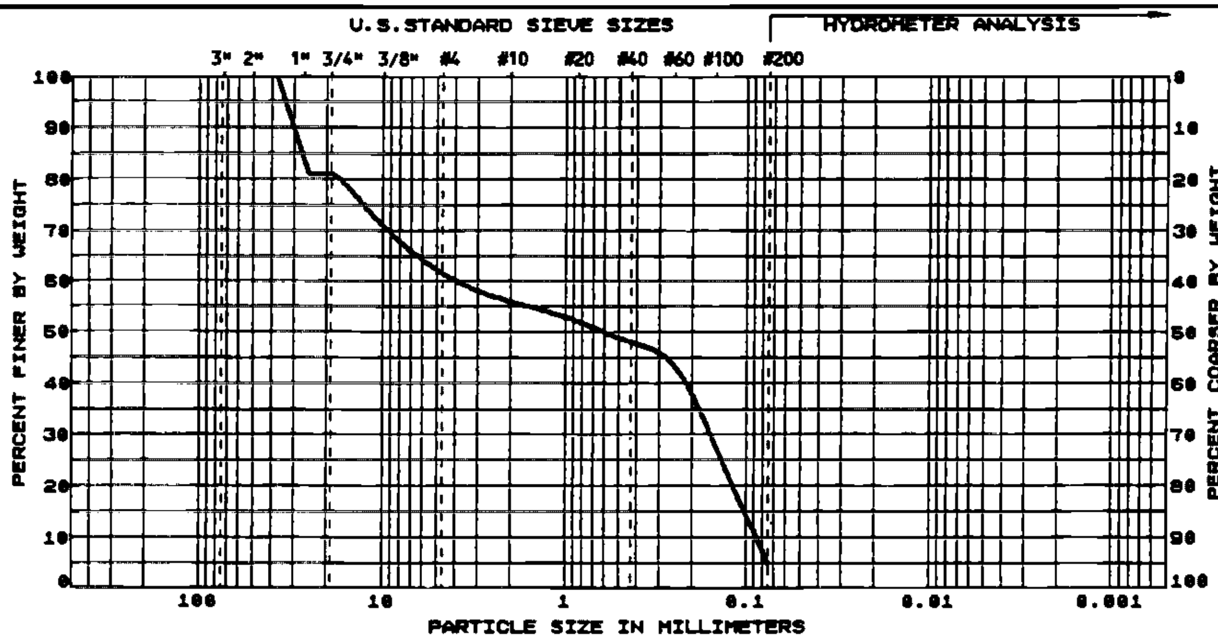
CLIENT JOB NO./PO#

JOB NO. 11-2588-0204Tsk000 DATE July 1, 1994

LAB NO. 04390 PAGE 8

PROJECT Griffiss AFB - RI

SAMPLE ID B20MW-2H 15-17'



COBBLES	GRAVEL		SAND			SILT & CLAY
	COARSE	FINE	CO.	MEDIUM	FINE	

U.S.STANDARD SIEVE SIZE		*PERCENT PASSING		HYDROMETER
SIEVE NO.	SIEVE SIZE (MILLIMETERS)			PARTICLE DIAMETER (MILLIMETERS)
3"	75			0.050
2"	50			0.020
1-1/2"	37.5	100.0		0.005
1"	25	81.2		0.002
3/4"	19	81.2		0.001
1/2"	12.5	74.6		
3/8"	9.5	70.3	*REMARKS: TABULATED HYDROMETER VALUES ARE COMPUTER INTERPOLATED FROM A LINEAR DATA PLOT. PLOTTED VALUES MAY BE MORE ACCURATE FOR THE 0.050 mm PARTICLE DIAMETER.	
No.4	4.75	61.8		
No.10	2.00	56.0		
No.20	0.850	52.2		
No.40	0.425	48.9		
No.60	0.250	43.3		
No.100	0.150	28.3		
No.200	0.075	4.8		
			TESTED BY: SC JM MO	

TOTAL POROSITY (%)

EFFECTIVE SIZE (mm)

COEFFICIENT OF UNIFORMITY 41.65

COEFFICIENT OF CURVATURE 0.88

LIQUID LIMIT NP

PLASTIC LIMIT NP

PLASTICITY INDEX NP

CLASSIFICATION POORLY GRADED SAND with GRAVEL (SP)

WATER CONTENT (%) 12.5

DRY DENSITY (PCF)

SPECIFIC GRAVITY OF SOLIDS

HYDRAULIC CONDUCTIVITY (cm/sec - 20C)

TEST PROCEDURES: ASTM D422, D2216, D4318, D2487.

LAW ENVIRONMENTAL, INC.

M.A. O'Kelley

LAW ENVIRONMENTAL, INC.
300 CHASTAIN CNTR BLVD, SUITE 315
KENNESAW, GEORGIA 30144
404-425-7879

PARTICLE SIZE DISTRIBUTION & PHYSICAL PROPERTIES

CLIENT Government Services

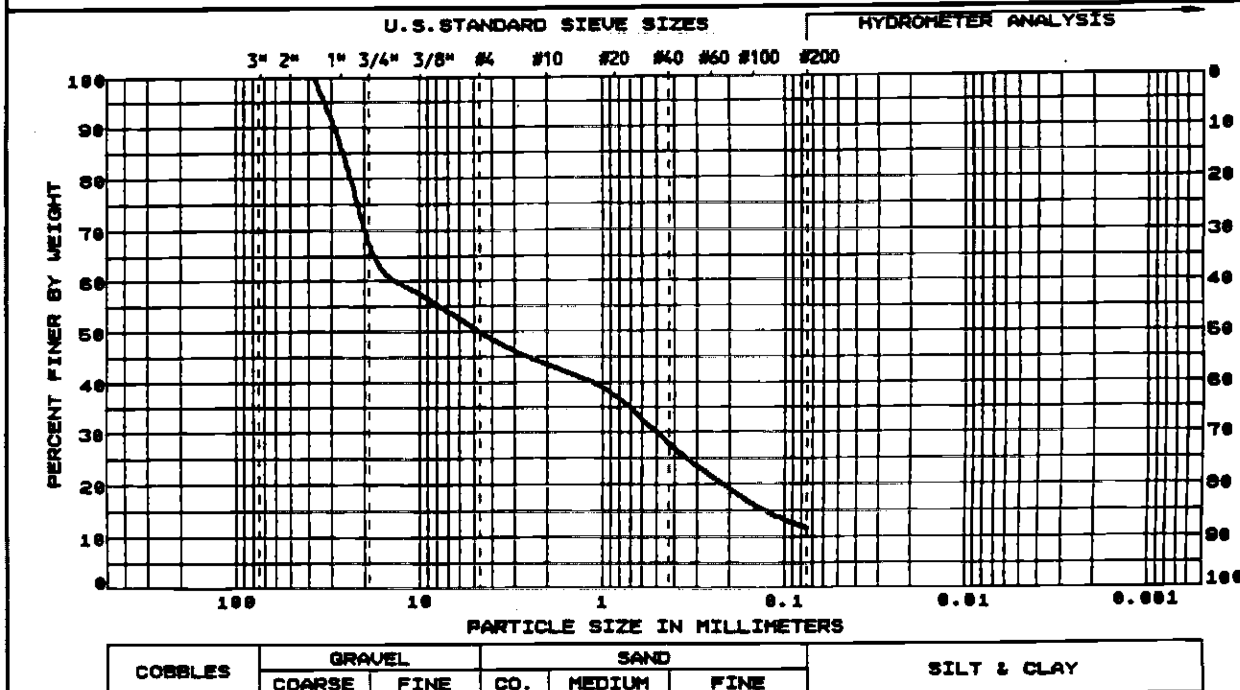
CLIENT JOB NO./PO#

JOB NO. 11-2688-0204Tsk000 DATE July 1, 1994

LAB NO. 04393 PAGE 11

PROJECT Griffiss AFB - RI

SAMPLE ID B20MW-3D 6-8'



U.S. STANDARD SIEVE SIZE		*PERCENT PASSING	HYDROMETER
SIEVE NO.	SIEVE SIZE (MILLIMETERS)		PARTICLE DIAMETER (MILLIMETERS)
3"	75		0.050
2"	50		0.020
1-1/2"	37.5	100.0	0.005
1"	25	82.7	0.002
3/4"	19	67.7	0.001
1/2"	12.5	59.4	
3/8"	9.5	57.1	
No.4	4.75	50.1	
No.10	2.00	43.8	
No.20	0.850	37.4	
No.40	0.425	27.8	
No.60	0.250	21.6	
No.100	0.150	16.4	
No.200	0.075	11.7	

*REMARKS: TABULATED HYDROMETER VALUES ARE COMPUTER INTERPOLATED FROM A LINEAR DATA PLOT. PLOTTED VALUES MAY BE MORE ACCURATE FOR THE 0.050 mm PARTICLE DIAMETER.

TESTED BY: SC JM MO

TOTAL POROSITY (%)
EFFECTIVE SIZE (mm)
COEFFICIENT OF UNIFORMITY 104.15
COEFFICIENT OF CURVATURE 0.27
LIQUID LIMIT NP
PLASTIC LIMIT NP
PLASTICITY INDEX NP
CLASSIFICATION POORLY GRADED GRAVEL with SILT and SAND (GP-GM)
WATER CONTENT (%) 7.6
DRY DENSITY (PCF)
SPECIFIC GRAVITY OF SOLIDS
HYDRAULIC CONDUCTIVITY (cm/sec - 20C)
TEST PROCEDURES: ASTM D422, D2216, D4318, D2487.

LAW ENVIRONMENTAL, INC.

M. A. O'Kelley

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LAW ENVIRONMENTAL, INC.

300 CHASTAIN CNTR BLVD, SUITE 315
KENNESAW, GEORGIA 30144
404-425-7879

PARTICLE SIZE DISTRIBUTION & PHYSICAL PROPERTIES

CLIENT Government Services

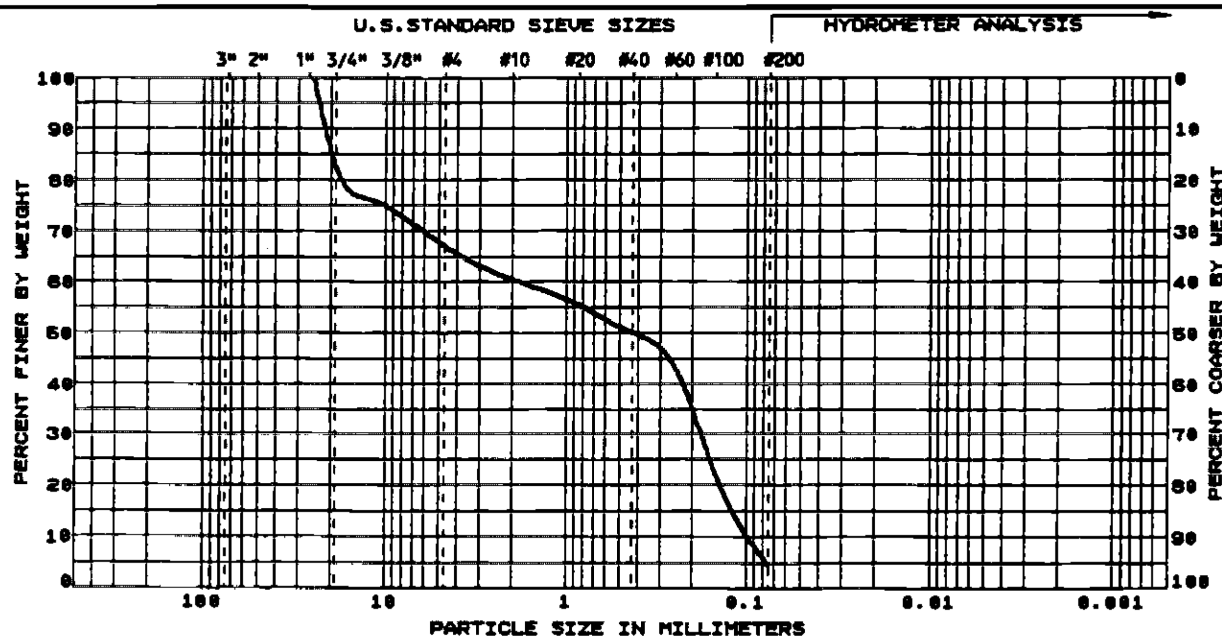
JOB NO. 11-2588-0204Tsk800 DATE July 1, 1994

LAB NO. 04394 PAGE 12

PROJECT Griffiss AFB - RI

CLIENT JOB NO./PO#

SAMPLE ID B20MW-3H 15-17'



COBBLES	GRAVEL		SAND			SILT & CLAY
	COARSE	FINE	CO.	MEDIUM	FINE	

U.S.STANDARD SIEVE SIZE		*PERCENT PASSING		HYDROMETER
SIEVE NO.	SIEVE SIZE (MILLIMETERS)			PARTICLE DIAMETER (MILLIMETERS)
3"	75			0.050
2"	50			0.020
1-1/2"	37.5			0.005
1"	25	100.0		0.002
3/4"	19	82.9		0.001
1/2"	12.5	76.3		
3/8"	9.5	74.5		
No.4	4.75	67.2		
No.10	2.00	60.6		
No.20	0.850	55.6		
No.40	0.425	50.1		
No.60	0.250	43.1		
No.100	0.150	22.6		
No.200	0.075	4.4		

*REMARKS: TABULATED HYDROMETER VALUES ARE COMPUTER INTERPOLATED FROM A LINEAR DATA PLOT. PLOTTED VALUES MAY BE MORE ACCURATE FOR THE 0.050 mm PARTICLE DIAMETER.

TESTED BY: SC JM MO

TOTAL POROSITY (%)

EFFECTIVE SIZE (mm)

COEFFICIENT OF UNIFORMITY 19.36

COEFFICIENT OF CURVATURE 0.20

LIQUID LIMIT NP

PLASTIC LIMIT NP

PLASTICITY INDEX NP

CLASSIFICATION POORLY GRADED SAND with GRAVEL (SP)

WATER CONTENT (%) 13.7

DRY DENSITY (PCF)

SPECIFIC GRAVITY OF SOLIDS

HYDRAULIC CONDUCTIVITY (cm/sec - 20C)

TEST PROCEDURES: ASTM D422, D2216, D4318, D2487.

LAW ENVIRONMENTAL, INC.

M. H. O'Kelly

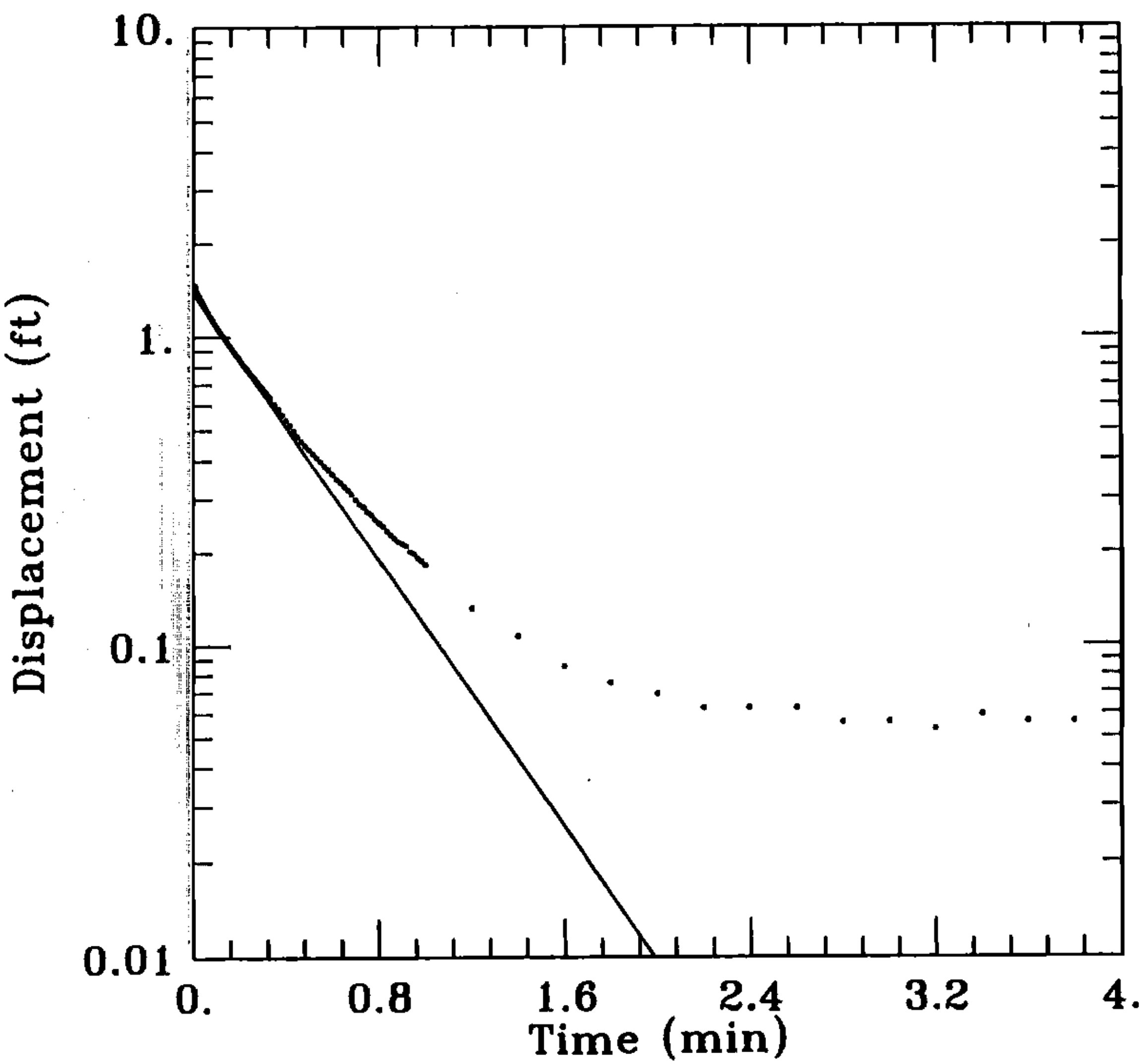
TAB

Appendix D

APPENDIX D

HYDRAULIC CONDUCTIVITY TEST RESULTS

Building 20 Locomotive Roundhouse



DATA SET:
B20-2-X.DAT
05/04/95

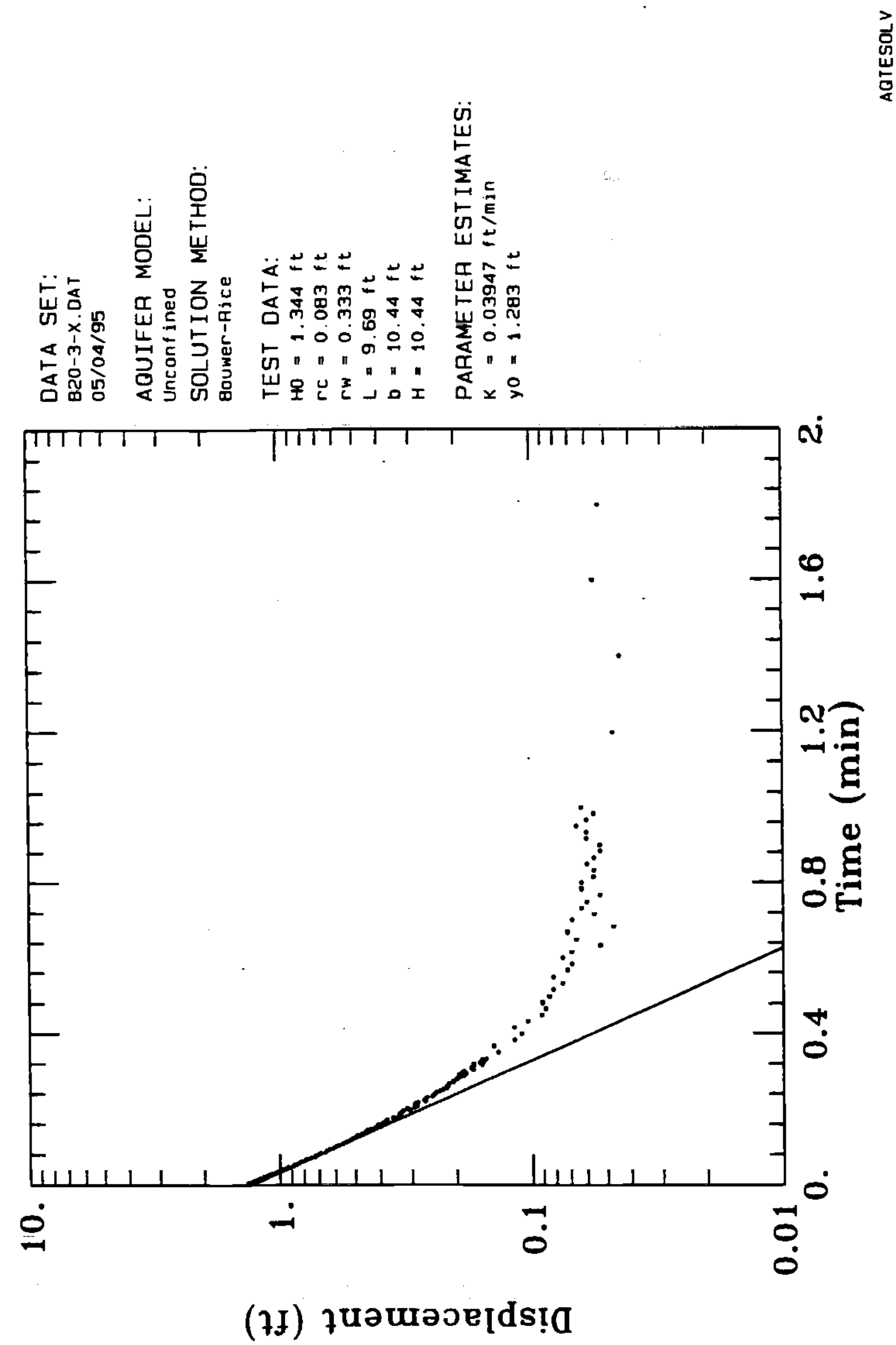
AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATA:
H0 = 1.47 ft
rc = 0.083 ft
rw = 0.333 ft
L = 9.59 ft
b = 10.35 ft
H = 10.35 ft

PARAMETER ESTIMATES:
K = 0.01274 ft/min
y0 = 1.38 ft

AQTESOLV


DATA SET:
B20-3-X.DAT
05/04/95
AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATA:
H0 = 1.344 ft
rc = 0.083 ft
rw = 0.333 ft
L = 9.69 ft
b = 10.44 ft
H = 10.44 ft
PARAMETER ESTIMATES:
K = 0.03947 ft/min
y0 = 1.283 ft
AQTESOLV
10.
1.
0.1
0.01
Displacement (ft)
0.
0.4
0.8
1.2
1.6
2.
Time (min)

947 138

TAB

Appendix E

APPENDIX E

LEVEL II FIELD SCREENING RESULTS - MEA, INC.

Building 20 Locomotive Roundhouse

Griffis AFB
Level 2 field Screening Results(Ug/Kg)
MEA Inc.
AOC: B-20
6/20/94

Method 8010

ANALYTE	SB1C	SB1D	SB3B	SB3C	SB3D
Vinyl Chloride	10U	10U	10U	10U	10U
1,1-Dichloroethylene	10U	10U	10U	10U	10U
Trichlororfluoromethane	10U	10U	10U	10U	10U
1,1-Dichloroethane	10U	10U	10U	10U	10U
Chloroform	10U	10U	10U	10U	10U
Carbontetrachloride	10U	10U	10U	10U	10U
Trichloroethylene	10U	10U	10U	10U	10U
1,2-Dichloropropane	10U	10U	10U	10U	10U
Bromodichloromethane	10U	10U	10U	10U	10U
cis-1,3-dichloropropene	10U	10U	10U	10U	10U
trans-1,3-dichloropropene	10U	10U	10U	10U	10U
1,1,2-Trichloroethane	10U	10U	10U	10U	10U
Tetrachloroethylene	10U	10U	10U	10U	10U
Dibromochloromethane	10U	10U	10U	10U	10U
Bromoform	10U	10U	10U	10U	10U
1,1,2,2-Tetrachloroethane	10U	10U	10U	10U	10U

Method 8020

ANALYTE	SB1C	SB1D	SB3B	SB3C	SB3D
trans-1,2-Dichloroethylene	10U	10U	10U	10U	10U
1,1-Dichloroethylene	10U	10U	10U	10U	10U
Benzene	10U	10U	10U	10U	10U
Trichloroethylene	10U	10U	10U	10U	10U
Cis-1,3-Dichloropropene	10U	10U	10U	10U	10U
Toluene	10U	10U	10U	10U	10U
trans-1,3-Dichloropropene	10U	10U	10U	10U	10U
Tetrachloroethylene	10U	10U	10U	10U	10U
Ethylbenzene	10U	10U	10U	10U	10U
Chlorobenzene	10U	10U	10U	10U	10U
1,3-Dichlorobenzene	10U	10U	10U	10U	10U
1,4-Dichlorobenzene	10U	10U	10U	10U	10U

U- not detected, Below MQL

Griffis AFB
Level 2 field Screening Results(Ug/Kg)
MEA Inc.
AOC: B-20
6/20/94

Preliminary Results - Re analyzing samples due to poor internal standard results.

Method 8010

ANALYTE	SB2	SB2C	SB2D	SB2E	HP2	SB1B
Vinyl Chloride	10U	10U	10U	10U	10U	10U
1,1-Dichloroethylene	10U	10U	10U	10U	10U	10U
Trichlororfluoromethane	10U	10U	10U	10U	10U	10U
1,1-Dichloroethane	10U	10U	10U	10U	10U	10U
Chloroform	10U	10U	10U	10U	10U	10U
Carbontetrachloride	10U	10U	10U	10U	10U	10U
Trichloroethylene	10U	10U	10U	10U	10U	10U
1,2-Dichloropropane	10U	10U	10U	10U	10U	10U
Bromodichloromethane	10U	10U	10U	10U	10U	10U
cis-1,3-dichloropropene	10U	10U	10U	10U	10U	10U
trans-1,3-dichloropropene	10U	10U	10U	10U	10U	10U
1,1,2-Trichloroethane	10U	10U	10U	10U	10U	10U
Tetrachloroethylene	10U	10U	10U	10U	10U	10U
Dibromochloromethane	10U	10U	10U	10U	10U	10U
Bromoform	10U	10U	10U	10U	10U	10U
1,1,2,2-Tetrachloroethane	10U	10U	10U	10U	10U	10U

Method 8020

ANALYTE	SB2	SB2C	SB2D	SB2E	HP2	SB1B
trans-1,2-Dichloroethylene	10U	10U	10U	10U	10U	10U
1,1-Dichloroethylene	10U	10U	10U	10U	10U	10U
Benzene	10U	10U	10U	10U	10U	10U
Trichloroethylene	10U	10U	10U	10U	10U	10U
Cis-1,3-Dichloropropene	10U	10U	10U	10U	10U	10U
Toluene	10U	10U	10U	10U	10U	10U
trans-1,3-Dichloropropene	10U	10U	10U	10U	10U	10U
Tetrachloroethylene	10U	10U	10U	10U	10U	10U
Ethylbenzene	10U	10U	10U	10U	10U	10U
Chlorobenzene	10U	10U	10U	10U	10U	10U
1,3-Dichlorobenzene	10U	10U	10U	10U	10U	10U
1,4-Dichlorobenzene	10U	10U	10U	10U	10U	10U

U- not detected, Below MQL

Griffis AFB
Level 2 field Screening Results(Ug/Kg)
MEA Inc.
AOC: B-20
7/6/94

Method 8010

ANALYTE	B20SB5B	B20SB5C	B20SB5D	B20SB5E	B20SB6B	B20SB6C
Vinyl Chloride	10U	10U	10U	10U	10U	10U
1,1-Dichloroethylene	10U	10U	10U	10U	10U	10U
Trichlororfluoromethane	10U	10U	10U	10U	10U	10U
1,1-Dichloroethane	10U	10U	10U	10U	10U	10U
Chloroform	10U	10U	10U	10U	10U	10U
Carbontetrachloride	10U	10U	10U	10U	10U	10U
Trichloroethylene	10U	10U	10U	10U	10U	10U
1,2-Dichloropropane	10U	10U	10U	10U	10U	10U
Bromodichloromethane	10U	10U	10U	10U	10U	10U
cis-1,3-dichloropropene	10U	10U	10U	10U	10U	10U
trans-1,3-dichloropropene	10U	10U	10U	10U	10U	10U
1,1,2-Trichloroethane	10U	10U	10U	10U	10U	10U
Tetrachloroethylene	10U	10U	10U	10U	10U	10U
Dibromochloromethane	10U	10U	10U	10U	10U	10U
Bromoform	10U	10U	10U	10U	10U	10U
1,1,2,2-Tetrachloroethane	10U	10U	10U	10U	10U	10U

Method 8020

ANALYTE	B20SB5B	B20SB5C	B20SB5D	B20SB5E	B20SB6B	B20SB6C
trans-1,2-Dichloroethylene	10U	10U	10U	10U	10U	10U
1,1-Dichloroethylene	10U	10U	10U	10U	10U	10U
Benzene	10U	10U	10U	10U	10U	10U
Trichloroethylene	10U	10U	10U	10U	10U	10U
Cis-1,3-Dichloropropene	10U	10U	10U	10U	10U	10U
Toluene	10U	10U	10U	10U	10U	10U
trans-1,3-Dichloropropene	10U	10U	10U	10U	10U	10U
Tetrachloroethylene	10U	10U	10U	10U	10U	10U
Ethylbenzene	10U	10U	10U	10U	10U	10U
Chlorobenzene	10U	10U	10U	10U	10U	10U
1,3-Dichlorobenzene	10U	10U	10U	10U	10U	10U
1,4-Dichlorobenzene	10U	10U	10U	10U	10U	10U

U- not detected, Below MQL

Griffis AFB
Level 2 field Screening Results(Ug/Kg)
MEA Inc.
AOC: B-20
6/20/94

Method 8100

ANALYTE	B20SB1B	B20SB1D	B20SB1C	B20SB3C	B20SB3B
Napthalene	330U	330U	330U	330U	330U
Acenapthalene	330U	330U	330U	330U	330U
Acenapthene	330U	330U	330U	330U	330U
Fluorene	330U	330U	330U	330U	330U
Phenanthrene	330U	330U	330U	330U	330U
Anthracene	330U	330U	330U	330U	330U
fluoranthene	330U	330U	330U	330U	330U
Pyrene	330U	330U	330U	330U	330U
Chrysene/ Benzo(a)anth	330U	330U	330U	330U	330U
Benzo(b)fluor Benzo(k)fluor	330U	330U	330U	330U	330U
Benzo(a)pyren	330U	330U	330U	330U	330U
Ideno(123cd)p	330U	330U	330U	330U	330U
Dibenzo(ah)an	330U	330U	330U	330U	330U
Benzo(ghi)Per	330U	330U	330U	330U	330U

U- Not detected. Below MQL

Method 8040

ANALYTE	B20SB1B	B20SB1D	B20SB1C	B20SB3C	B20SB3B
Phenol	330U	330U	330U	330U	330U
2-chlorophenol	330U	330U	330U	330U	330U
2,4-Dimethylphenol	330U	330U	330U	330U	330U
2,4-dichlorophenol	330U	330U	330U	330U	330U
2-nitrophenol	330U	330U	330U	330U	330U
4-(Cl)-3-methylphenol	330U	330U	330U	330U	330U
2,4,6-trichlorophenol	330U	330U	330U	330U	330U
4-nitrophenol	330U	330U	330U	330U	330U
Pentachlorophenol	330U	330U	330U	330U	330U
2,4-Dinitrophenol	330U	330U	330U	330U	330U
2(CH3)4,6Dinitrophenol	330U	330U	330U	330U	330U

Griffis AFB
Level 2 field Screening Results(Ug/Kg)
MEA Inc.
AOC: B-20
6/20/94

Method 8100

ANALYTE	B20HP2	B20SB2	B20SB2D	B20SB2E	B20SB2C	B20SB3D
Napthalene	330U	330U	330U	330U	330U	330U
Acenapthalene	330U	330U	330U	330U	330U	330U
Acenapthene	330U	330U	330U	330U	330U	330U
Fluorene	330U	330U	330U	330U	330U	330U
Phenanthrene	330U	330U	330U	330U	330U	330U
Anthracene	330U	330U	330U	330U	330U	330U
fluoranthene	330U	330U	330U	330U	330U	330U
Pyrene	330U	330U	330U	330U	330U	330U
Chrysene/ Benzo(a)anth	330U	330U	330U	330U	330U	330U
Benzo(b)fluor Benzo(k)fluor	330U	330U	330U	330U	330U	330U
Benzo(a)pyren	330U	330U	330U	330U	330U	330U
Ideno(123cd)p	330U	330U	330U	330U	330U	330U
Dibenzo(ah)an	330U	330U	330U	330U	330U	330U
Benzo(ghi)Per	330U	330U	330U	330U	330U	330U

U- Not detected, Below MQL

Method 8040

ANALYTE	B20HP2	B20SB2	B20SB2D	B20SB2E	B20SB2C	B20SB3D
Phenol	330U	330U	330U	330U	330U	330U
2-chlorophenol	330U	330U	330U	330U	330U	330U
2,4-Dimethylphenol	330U	330U	330U	330U	330U	330U
2,4-dichlorophenol	330U	330U	330U	330U	330U	330U
2-nitrophenol	330U	330U	330U	330U	330U	330U
4-(Cl)-3-methylphenol	330U	330U	330U	330U	330U	330U
2,4,6-trichlorophenol	330U	330U	330U	330U	330U	330U
4-nitrophenol	330U	330U	330U	330U	330U	330U
Pentachlorophenol	330U	330U	330U	330U	330U	330U
2,4-Dinitrophenol	330U	330U	330U	330U	330U	330U
2(CH3)4,6Dinitrophenol	330U	330U	330U	330U	330U	330U

Griffis AFB
Level 2 field Screening Results(Ug/Kg)
MEA Inc.
AOC: B-20
7/6/94

Method 8100

ANALYTE	B20SB5B	B20SB5C	B20SB5D	B20SB5E	B20SB6B	B20SB6C
Napthalene	330U	330U	330U	330U	330U	330U
Acenapthalene	330U	330U	330U	330U	330U	330U
Acenapthene	330U	330U	330U	330U	330U	330U
Fluorene	330U	330U	330U	330U	330U	330U
Phenanthrene	330U	330U	330U	330U	330U	330U
Anthracene	330U	330U	330U	330U	330U	330U
fluoranthene	2020.37	330U	330U	330U	330U	330U
Pyrene	2695.82	330U	330U	330U	330U	330U
Chrysene/ Benzo(a)anth	330U	330U	330U	330U	330U	330U
Benzo(b)fluor Benzo(k)fluor	330U	330U	330U	330U	330U	330U
Benzo(a)pyren	330U	330U	330U	330U	330U	330U
Ideno(123cd)p	330U	330U	330U	330U	330U	330U
Dibenzo(ah)an	330U	330U	330U	330U	330U	330U
Benzo(ghi)Per	330U	330U	330U	330U	330U	330U

Method 8040

ANALYTE	B20SB5B	B20SB5C	B20SB5D	B20SB5E	B20SB6B	B20SB6C
Phenol	330U	330U	330U	330U	330U	330U
2-chlorophenol	330U	330U	330U	330U	330U	330U
2,4-Dimethylphenol	330U	330U	330U	330U	330U	330U
2,4-dichlorophenol	330U	330U	330U	330U	330U	330U
2-nitrophenol	330U	330U	330U	330U	330U	330U
4-(Cl)-3-methylphenol	330U	330U	330U	330U	330U	330U
2,4,6-trichlorophenol	330U	330U	330U	330U	330U	330U
4-nitrophenol	330U	330U	330U	330U	330U	330U
Pentachlorophenol	660U	660U	660U	660U	660U	660U
2,4-Dinitrophenol	660U	660U	660U	660U	660U	660U
2-chloro-4,6-Dinitrophenol	660U	660U	660U	660U	660U	660U

U - Not detected, Below MQL

* **Note 1:** All samples have two compounds that elute at the same retention time as pentachlorophenol and 2-methyl-4,6-dinitrophenol. The second column confirmation did not confirm these phenols were actually present. The concentration of these unknown compounds is less than 2 ppm.

Note 2: Detection limits for pentachlorophenol, 2,4-dinitrophenol, and 2,chloro-4,6-dinitrophenol have been raised to 660U due to degradating response on FID.

* method blank - also contained these contaminants.

Griffis AFB
Level 2 field Screening Results(Ug/Kg)
MEA Inc.
AOC: B-20
7/6/94

Method 8100

ANALYTE	B20SB4B	B20SB4C	B20SB4D
Napthalene	330U	330U	330U
Acenapthalene	330U	330U	330U
Acenapthene	330U	330U	330U
Fluorene	330U	330U	330U
Phenanthrene	330U	330U	330U
Anthracene	330U	330U	330U
fluoranthene	330U	330U	330U
Pyrene	330U	330U	330U
Chrysene/ Benzo(a)anth	330U	330U	330U
Benzo(b)fluor Benzo(k)fluor	330U	330U	330U
Benzo(a)pyren	330U	330U	330U
Ideno(123cd)p	330U	330U	330U
Dibenzo(ah)an	330U	330U	330U
Benzo(ghi)Per	330U	330U	330U

Method 8040

ANALYTE	B20SB4B	B20SB4C	B20SB4D
Phenol	330U	330U	330U
2-chlorophenol	330U	330U	330U
2,4-Dimethylphenol	330U	330U	330U
2,4-dichlorophenol	330U	330U	330U
2-nitrophenol	330U	330U	330U
4-(Cl)-3-methylphenol	330U	330U	330U
2,4,6-trichlorophenol	330U	330U	330U
4-nitrophenol	330U	330U	330U
Pentachlorophenol	660U	660U	660U
2,4-Dinitrophenol	660U	660U	660U
2(CH3)4,6Dinitrophenol	660U	660U	660U

U - Not detected, Below MQL

* **Note 1:** All samples have two compounds that elute at the same retention time as pentachlorophenol and 2-methyl-4,6-dinitrophenol. The second column confirmation did not confirm these phenols were actually present. The concentration of these unknown compounds is less than 2 ppm.

Note 2: Detection limits for pentachlorophenol, 2,4-dinitrophenol, and 2,chloro-4,6-dinitrophenol have been raised to 660U due to degradating response on FID.

* Method Blank also contained these Contaminants

Griffis AFB
Level 2 field Screening Results(Ug/Kg)
MEA Inc.
AOC: B-20
6/20/94

Method 8080 (PCB's/Pesticides)

ANALYTE	B20SB2	B20SB2D	B20HP20	B20SB2E	B20SB2C	B20SB1B
A-BHC	100U	100U	100U	100U	100U	100U
B-BHC	100U	100U	100U	100U	100U	100U
G-BHC	100U	100U	100U	100U	100U	100U
D-BHC	100U	100U	100U	100U	100U	100U
Heptichlor	100U	100U	100U	100U	100U	100U
Aldrin	100U	100U	100U	100U	100U	100U
Heptichlor Epoxide	100U	100U	100U	100U	100U	100U
endosulfan 1	100U	100U	100U	100U	100U	100U
dieldrin	100U	100U	100U	100U	100U	100U
DDE	100U	100U	100U	100U	100U	100U
endrin	100U	100U	100U	100U	100U	100U
endosulfan II	100U	100U	100U	100U	100U	100U
DDD	100U	100U	100U	100U	100U	100U
endrin aldehyde	100U	100U	100U	100U	100U	100U
endosulfan sulfate	100U	100U	100U	100U	100U	100U
DDT	100U	100U	100U	100U	100U	100U
Endrin Ketone	100U	100U	100U	100U	100U	100U
Heptachlor Epoxide	100U	100U	100U	100U	100U	100U
1016	660U	660U	660U	660U	660U	660U
1221	660U	660U	660U	660U	660U	660U
1232	660U	660U	660U	660U	660U	660U
1242	660U	660U	660U	660U	660U	660U
1248	660U	660U	660U	660U	660U	660U
1254	660U	660U	660U	660U	660U	660U
1260	660U	660U	660U	660U	660U	660U
Toxaphene	660U	660U	660U	660U	660U	660U
Chlordane	660U	660U	660U	660U	660U	660U

Griffis AFB
Level 2 field Screening Results(Ug/Kg)
MEA Inc.
AOC: B-20
6/20/94

Method 8080 (PCB's/Pesticides)

ANALYTE	B20SB3B	B20SB1C	B20SB1D	B20SB3C	B20SB3D
A-BHC	100U	100U	100U	100U	100U
B-BHC	100U	100U	100U	100U	100U
G-BHC	100U	100U	100U	100U	100U
D-BHC	100U	100U	100U	100U	100U
Heptichlor	100U	100U	100U	100U	100U
Aldrin	100U	100U	100U	100U	100U
Heptichlor Epoxide	100U	100U	100U	100U	100U
endosulfan 1	100U	100U	100U	100U	100U
dieldrin	100U	100U	100U	100U	100U
DDE	100U	100U	100U	100U	100U
endrin	100U	100U	100U	100U	100U
endosulfan II	100U	100U	100U	100U	100U
DDD	100U	100U	100U	100U	100U
endrin aldehyde	100U	100U	100U	100U	100U
endosulfan sulfate	100U	100U	100U	100U	100U
DDT	100U	100U	100U	100U	100U
Endrin Ketone	100U	100U	100U	100U	100U
Heptachlor Epoxide	100U	100U	100U	100U	100U
1016	660U	660U	660U	660U	660U
1221	660U	660U	660U	660U	660U
1232	660U	660U	660U	660U	660U
1242	660U	660U	660U	660U	660U
1248	660U	660U	660U	660U	660U
1254	660U	660U	660U	660U	660U
1260	660U	660U	660U	660U	660U
Toxaphene	660U	660U	660U	660U	660U
Chlordane	660U	660U	660U	660U	660U

Griffis AFB
Level 2 field Screening Results(Ug/Kg)
MEA Inc.
AOC: B-20
7/7/94

Method 8080 (PCB's)

ANALYTE	B20SB5B	B20SB5C	B20SB5D	B20SB5E	B20SB6B	B20SB6C
1016	660U	660U	660U	660U	660U	660U
1221	660U	660U	660U	660U	660U	660U
1232	660U	660U	660U	660U	660U	660U
1242	660U	660U	660U	660U	660U	660U
1248	660U	660U	660U	660U	660U	660U
1254	660U	660U	660U	660U	660U	660U
1260	660U	660U	660U	660U	660U	660U

Method 8080 (PCB's)

ANALYTE	B20SB4D	B20SB4B	B20SB4C
1016	660U	660U	660U
1221	660U	660U	660U
1232	660U	660U	660U
1242	660U	660U	660U
1248	660U	660U	660U
1254	660U	660U	660U
1260	660U	660U	660U

MEA INC.
METALS DATA SUMMARY
(ICP Modified 6010)
GRIFFISS AFB ROME NY

Client: Law Environmental
Date: June 20, 1994 / June 21, 1994
Analyst: TD

Element	Soils MDL mg/kg	Sample: B20SB-2	Sample: B20SB-2C	Sample: B20SB-2D	Sample: B20SB-2E	Sample: B20SB-1B	Sample: B20SB-3B	Sample: B20SB-1C	Sample: B20SB-3C
Ag	10.0	ND	ND	ND	ND	ND	ND	ND	ND
Al	7.0	1391	2361	3695	5280	7079	6563	5357	5471
As	100	ND	ND	ND	ND	ND	ND	ND	ND
B	2.0	ND	ND	ND	ND	ND	ND	ND	ND
Ba	20	ND	ND	ND	ND	ND	ND	ND	ND
Be	1.0	ND	ND	ND	ND	ND	ND	ND	ND
Ca	30	18527 5	198017	134199	20457	3811	93705	54443	1755
Cd	5.0	ND	ND	ND	ND	ND	ND	ND	ND
Co	0.3	ND	ND	104	ND	ND	ND	ND	ND
Cr	0.7	ND	ND	ND	ND	ND	ND	ND	ND
Cu	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Fe	100	2509 J	3990 J	9310 J	9878 J	12216	16118	9300 J	10583 J
Mg	35	5577	6565	5351	3148 J	2366 J	5155	3519 J	1944 J
Mn	0.3	119	133	238	792	449	324	286	422
Mo	20	ND	ND	ND	ND	ND	ND	ND	ND
Ni	4.0	ND	ND	ND	ND	ND	ND	ND	ND
Pb	100	ND	ND	ND	ND	ND	ND	ND	ND
Sb	7.0	ND	ND	ND	ND	ND	ND	ND	ND
Se	100	ND	ND	ND	ND	ND	ND	ND	ND
Si	20	ND	ND	ND	ND	ND	ND	ND	ND
V	20	ND	ND	ND	ND	ND	ND	ND	ND
Zn	5.0	ND	ND	ND	ND	ND	ND	ND	ND

* - Indicates matrix is water. Water sample detection limits are the same as the IDL's reported to Law Environmental By MEA Inc. on May 23,1994.

ND - Indicates not detected

J - Indicates an estimated value

ICPRES

MEA INC.
METALS DATA SUMMARY
(ICP Modified 6010)
GRIFFISS AFB ROME NY

Client: Law Environmental
Date: June 20, 1994 / June 21, 1994
Analyst: TD

Element	Soils MDL mg/kg	Sample: B20SB-3D	Sample: B20SB-1D
Ag	10.0	ND	ND
Al	7.0	5949	3719
As	100	ND	ND
B	2.0	ND	ND
Ba	20	ND	ND
Be	1.0	ND	ND
Ca	30	1459 J	1012 J
Cd	5.0	ND	ND
Co	0.3	ND	ND
Cr	0.7	ND	ND
Cu	0.3	ND	ND
Fe	100	10764 J	11544
Mg	35	1861 J	1569 J
Mn	0.3	382	359
Mo	20	ND	ND
Ni	4.0	ND	ND
Pb	100	ND	ND
Sb	7.0	ND	ND
Se	100	ND	ND
Si	20	ND	ND
V	20	ND	ND
Zn	5.0	ND	ND

* - Indicates matrix is water. Water sample detection limits are the same as the IDL's reported to Law Environmental By MEA Inc. on May 23,1994.

ND - Indicates not detected

J - Indicates an estimated value

ICPRES

MEA INC.
METALS DATA SUMMARY
(ICP Modified 6010)
GRIFFISS AFB ROME NY

Client: Law Environmental
Date: June 20, 1994 / June 21, 1994
Analyst: TD

Element	Soils MDL mg/kg	Sample: B20SB-3D	Sample: B20SB-1D
Ag	10.0	ND	ND
Al	7.0	5949	3719
As	100	ND	ND
B	2.0	ND	ND
Ba	20	ND	ND
Be	1.0	ND	ND
Ca	30	1459 J	1012 J
Cd	5.0	ND	ND
Co	0.3	ND	ND
Cr	0.7	ND	ND
Cu	0.3	ND	ND
Fe	100	10764 J	11544
Mg	35	1861 J	1569 J
Mn	0.3	382	359
Mo	20	ND	ND
Ni	4.0	ND	ND
Pb	100	ND	ND
Sb	7.0	ND	ND
Se	100	ND	ND
Si	20	ND	ND
V	20	ND	ND
Zn	5.0	ND	ND

* - Indicates matrix is water. Water sample detection limits are the same as the IDL's reported to Law Environmental By MEA Inc. on May 23,1994.

ND - Indicates not detected

J - Indicates an estimated value

ICPRES

MEA INC.
METALS DATA SUMMARY
(ICP Modified 6010)
GRIFFISS AFB ROME NY

Client: Law Environmental
Date: July 7, 1994 / July 7, 1994
Analyst: TD

Element	Soils MDL mg/kg	Sample: B20SB4B	Sample: B20SB4C	Sample: B20SB4D
Ag	10.0	ND	ND	ND
Al	7.0	4478	4253	2760
As	100	ND	ND	ND
B	2.0	ND	ND	ND
Ba	20	ND	ND	ND
Be	1.0	ND	ND	ND
Ca	30	2908 J	443	951 J
Cd	5.0	ND	ND	ND
Co	0.3	ND	ND	ND
Cr	0.7	ND	ND	ND
Cu	0.3	ND	ND	ND
Fe	100	10698 J	7564 J	6159 J
Mg	35	1438 J	1118 J	1034 J
Mn	0.3	430	74.0	135
Mo	20	ND	ND	ND
Ni	4.0	ND	ND	ND
Pb	100	ND	ND	ND
Sb	7.0	ND	ND	ND
Se	100	ND	ND	ND
Si	20	ND	ND	133 J
V	20	ND	ND	ND
Zn	5.0	ND	ND	ND

* - Indicates matrix is water. Water sample detection limits are the same as the IDL's reported to Law Environmental By MEA Inc. on May 23,1994.

ND - Indicates not detected

J - Indicates an estimated value

ICPRES

MEA INC.
METALS DATA SUMMARY
(ICP Modified 6010)
GRIFFISS AFB ROME NY

Client: Law Environmental
Date: July 6, 1994 / July 7, 1994
Analyst: TD

Element	Soils MDL mg/kg	Sample: B20SB5B	Sample: B20SB5C	Sample: B20SB5D	Sample: B20SB5E	Sample: B20SB6B	Sample: B20SB6C
Ag	10.0	ND	ND	ND	ND	ND	ND
Al	7.0	5526	2469	4582	3195	4443	4019
As	100	ND	ND	ND	ND	ND	ND
B	2.0	ND	ND	ND	ND	ND	ND
Ba	20	ND	ND	ND	ND	ND	ND
Be	1.0	ND	ND	ND	ND	ND	ND
Ca	30	1551	285 J	300 J	669 J	415 J	46813
Cd	5.0	ND	ND	ND	ND	ND	ND
Co	0.3	ND	ND	ND	ND	ND	ND
Cr	0.7	ND	ND	ND	ND	ND	ND
Cu	0.3	ND	ND	ND	ND	ND	ND
Fe	100	12984	4964 J	11174	9567 J	9267 J	38769
Mg	35	1908 J	780 J	1789 J	1515 J	1408 J	2847 J
Mn	0.3	944	176	400	615	378	562
Mo	20	ND	ND	ND	ND	ND	ND
Ni	4.0	ND	ND	ND	ND	ND	ND
Pb	100	ND	ND	ND	ND	ND	ND
Sb	7.0	ND	ND	ND	ND	ND	ND
Se	100	ND	ND	ND	ND	ND	ND
Si	20	ND	ND	ND	ND	ND	904 J
V	20	ND	ND	ND	ND	ND	ND
Zn	5.0	ND	ND	ND	ND	ND	451 J

* - Indicates matrix is water. Water sample detection limits are the same as the IDL's reported to Law Environmental By MEA Inc. on May 23,1994.

ND - Indicates not detected

J - Indicates an estimated value

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TAB

Appendix F

APPENDIX F

ANALYTICAL DATA SUMMARY TABLES

Building 20 Locomotive Roundhouse

Table F.1: Analytical Data Summary for Subsurface Soils
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample I.D.	B20SB-1D	(1) B20SB-1D 01	B20SB-2D	B-20SB-2E	B-20SB-3D	B20SB-4D	B20SB-4D	B20SB-5B	B20SB-5B	B20SB-5E	B20SB-6B
Laboratory	(R)	(R)	(R)	(R)	(R)	(R)	(L)	(R)	(L)	(R)	(R)
Sample Date	06-20-94	06-20-94	06-20-94	06-20-94	06-20-94	07-06-94	11-16-94	07-06-94	11-16-94	07-06-94	07-06-94
Sample Depth	(5-7')	(5-7')	(5-7')	(7-9')	(4-6')	(4-6')	(4-6')	(.5-2.5')	(0-2')	(6.5-8.5')	(4.75-6.75')
METHOD: SW-846 8240											
VOLATILES: (µg/kg)											
1,1,1-Trichloroethane	6 U	6 U	6 U	--	--	--	6 U	--	6 U	--	--
1,1,1,2-Tetrachloroethane	6 U	6 U	6 U	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	6 U	6 U	6 U	--	--	--	6 U	--	6 U	--	--
1,1,2-Trichloroethane	6 U	6 U	6 U	--	--	--	6 U	--	6 U	--	--
1,1-Dichloroethane	6 U	6 U	6 U	--	--	--	6 U	--	6 U	--	--
1,1-Dichloroethene	6 U	6 U	6 U	--	--	--	6 U	--	6 U	--	--
1,2-Dichloroethane	6 U	6 U	6 U	--	--	--	6 U	--	6 U	--	--
1,2-Dichloroethene (total)	6 U	6 U	6 U	--	--	--	6 U	--	6 U	--	--
1,2-Dichloropropane	6 U	6 U	6 U	--	--	--	6 U	--	6 U	--	--
1,2,4-Trimethylbenzene	6 U	6 U	6 U	--	--	--	--	--	--	--	--
1,3,5-Trimethylbenzene (Mesitylene)	6 U	6 U	6 U	--	--	--	--	--	--	--	--
2-Butanone	12 U	12 U	11 U	--	--	--	12 U	--	11 U	--	--
2-Hexanone	12 U	12 U	11 U	--	--	--	12 U	--	11 U	--	--
4-Methyl-2-pentanone	12 U	12 U	11 U	--	--	--	12 U	--	11 U	--	--
Acetone	12 U	12 U	11 U	--	--	--	4 J	--	60	--	--
Benzene	6 U	6 U	6 UJ	--	--	--	6 U	--	5 J	--	--
bis-(Chloromethyl)Ether	30 U	29 U	28 U	--	--	--	--	--	--	--	--
Bromodichloromethane	6 U	6 U	6 U	--	--	--	6 U	--	6 U	--	--
Bromoform	6 U	6 U	6 U	--	--	--	6 U	--	6 U	--	--
Bromomethane	12 U	12 U	11 U	--	--	--	12 U	--	11 U	--	--
Carbon Disulfide	6 U	6 U	6 U	--	--	--	6 U	--	6 U	--	--
Carbon Tetrachloride	6 U	6 U	6 U	--	--	--	6 U	--	6 U	--	--
Chlorobenzene	6 U	6 U	6 UJ	--	--	--	6 U	--	6 U	--	--
Chloroethane	12 U	12 U	11 U	--	--	--	12 U	--	11 U	--	--
Chloroform	6 U	6 U	6 U	--	--	--	6 U	--	6 U	--	--
Chloromethane	12 U	12 U	11 U	--	--	--	12 U	--	11 U	--	--
cis-1,3-Dichloropropene	6 U	6 U	6 U	--	--	--	6 U	--	6 U	--	--
Dibromochloromethane	6 U	6 U	6 U	--	--	--	6 U	--	6 U	--	--
Ethylbenzene	6 U	6 U	6 U	--	--	--	6 U	--	10	--	--
Methylene Chloride	6 U	6 U	6 U	--	--	--	5 U	--	5 U	--	--
Pentachloroethane	6 U	6 U	6 U	--	--	--	--	--	--	--	--
p-Monochlorobenzotrifluoride	6 U	6 U	6 U	--	--	--	--	--	--	--	--
Styrene	6 U	6 U	6 U	--	--	--	6 U	--	6 U	--	--
Tetrachloroethene	6 U	6 U	6 U	--	--	--	6 U	--	6 U	--	--
Toluene	6 U	6 U	8 U	--	--	--	2 J	--	8	--	--
trans-1,3-Dichloropropene	6 U	6 U	6 U	--	--	--	6 U	--	6 U	--	--
Trichloroethene	--	--	--	--	--	--	6 U	--	6 U	--	--
Trichloroethylene (TCE)	6 U	6 U	6 UJ	--	--	--	--	--	--	--	--
Vinyl Acetate	12 U	12 U	11 U	--	--	--	--	--	--	--	--
Vinyl Chloride	12 U	12 U	11 U	--	--	--	12 U	--	11 U	--	--
Xylene (total)	6 U	6 U	6 U	--	--	--	6 U	--	56	--	--
SURROGATE RECOVERY (%)											
1,2-Dichloroethane-d4 (70-121)	90	88	92	--	--	--	96	--	94	--	--
Toluene-d8 (81-117)	98	94	103	--	--	--	98	--	114	--	--
4-Bromofluorobenzene (74-121)	96	97	100	--	--	--	94	--	103	--	--
METHOD: SW-846 8270											
SEMI-VOLATILES: (µg/kg)											
1,1-Diphenylhydrazine	380 W	370 W	480 W	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
1,2,4,5-Tetrachlorobenzene	380 U	370 U	480 U	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
1,2-Diphenylhydrazine	1800 U	1800 U	2300 U	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--

Table F.1: Analytical Data Summary for Subsurface Soils
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample I.D.	B20SB-1D	(1) B20SB-1D 01	B20SB-2D	B-20SB-2E	B-20SB-3D	B20SB-4D	B20SB-4D	B20SB-5B	B20SB-5B	B20SB-5B	B20SB-6B
Laboratory	(R)	(R)	(R)	(R)	(R)	(R)	(L)	(R)	(L)	(R)	(R)
Sample Date	06-20-94	06-20-94	06-20-94	06-20-94	06-20-94	07-06-94	11-16-94	07-06-94	11-16-94	07-06-94	07-06-94
Sample Depth	(5-7')	(5-7')	(5-7')	(7-9')	(4-6')	(4-6')	(4-6')	(.5-2.5')	(0-2')	(6.5-8.5')	(4.75-6.75')
1,4-Benezenediol	380 W	370 W	480 W	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
2,2'-oxybis (1-Chloropropane)	--	--	--	--	--	--	390 U	--	750 U	--	--
2,4,5-Trichlorophenol	1800 U	1800 U	2300 U	--	--	--	390 U	--	750 U	--	--
2,4,6-Trichlorophenol	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
2,4-Dichlorophenol	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
2,4-Dimethylphenol	380 U	370 U	480 U	--	--	--	390 U	--	130 J	--	--
2,4-Dinitrophenol	1800 U	1800 U	2300 U	--	--	--	970 U	--	1900 U	--	--
2,4-Dinitrotoluene	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
2,6-Dinitrotoluene	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
2-Chloronaphthalene	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
2-Chlorophenol	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
2-Methylnaphthalene	380 U	370 U	480 U	--	--	--	390 U	--	29000	--	--
2-Methylphenol	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
2-Nitroaniline	1800 U	1800 U	2300 U	--	--	--	390 U	--	750 U	--	--
2-Nitrophenol	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
3,3'-Dichlorobenzidine	760 U	750 U	960 U	--	--	--	790 U	--	1500 UJ	--	--
3-Methylphenol	1800 U	1800 U	2300 U	--	--	--	--	--	--	--	--
3-Nitroaniline	1800 U	1800 U	2300 U	--	--	--	390 U	--	750 U	--	--
4,6-Dinitro-2-methylphenol	1800 U	1800 U	2300 U	--	--	--	970 U	--	1900 U	--	--
4-Bromophenyl phenyl ether	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
4-Chloroaniline	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
4-Chlorophenyl phenyl ether	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
4-Chlorotoluene	380 W	370 W	480 W	--	--	--	--	--	--	--	--
4-Chloro-3-methylphenol	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
4-Methylphenol	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
4-Nitroaniline	1800 U	1800 U	2300 U	--	--	--	390 U	--	750 U	--	--
4-Nitrophenol	1800 U	1800 U	2300 U	--	--	--	970 U	--	1900 U	--	--
Acenaphthene	380 U	11 J	480 U	--	--	--	390 U	--	10000	--	--
Acenaphthylene	380 U	370 U	480 U	--	--	--	390 U	--	1700	--	--
Aniline (Phenylamine, Aminobenzene)	380 U	370 U	480 U	--	--	--	--	--	--	--	--
Anthracene	380 U	30 J	480 U	--	--	--	390 U	--	9700	--	--
Azinphos, Methyl (Guthion)	380 W	370 W	480 W	--	--	--	--	--	--	--	--
Azobenzene	380 U	370 U	480 U	--	--	--	--	--	--	--	--
Benzidine	3000 U	2900 U	3800 U	--	--	--	--	--	--	--	--
benzo (a) anthracene	380 U	370 U	480 U	--	--	--	390 U	--	31000 J	--	--
benzo (a) pyrene	380 U	52 J	480 U	--	--	--	390 U	--	25000 R	--	--
benzo (b) fluoranthene	36 J	67 J	36 J	--	--	--	390 U	--	30000 R	--	--
benzo (g,h,i) perylene	380 U	370 U	480 U	--	--	--	390 U	--	11000 R	--	--
benzo (k) fluoranthene	380 U	56 J	480 U	--	--	--	390 U	--	8900 R	--	--
Benzoic acid	1800 U	1800 U	2300 U	--	--	--	2000 U	--	3700 U	--	--
Benzyl Alcohol	380 U	370 U	480 U	--	--	--	--	--	--	--	--
bis(2-chloroethoxy)methane	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
bis(2-chloroethyl)ether	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
bis(2-chloroisopropyl)ether	380 U	370 U	480 U	--	--	--	--	--	--	--	--
bis(2-ethylhexyl)phthalate	35 J	80 J	39 J	--	--	--	190 J	--	130 J	--	--
Butyl benzyl phthalate	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
Carbazole	--	--	--	--	--	--	390 U	--	4500	--	--
Chrysene	380 U	370 U	480 U	--	--	--	390 U	--	38000 J	--	--
Dibenz (a,h) anthracene	380 U	370 U	480 U	--	--	--	390 U	--	3600 R	--	--
Dibenzofuran	380 U	370 U	480 U	--	--	--	390 U	--	5000	--	--
Diethyl phthalate	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
Dimethyl phthalate	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
Di-n-butyl phthalate	380 U	370 U	480 U	--	--	--	390 U	--	750 U	--	--
Di-n-octyl phthalate	380 U	370 U	480 U	--	--	--	390 U	--	750 R	--	--
Ethylenethiourea	380 W	370 W	480 W	--	--	--	--	--	--	--	--
Ferbam	380 W	370 W	480 W	--	--	--	--	--	--	--	--

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Table F.1: Analytical Data Summary for Subsurface Soils
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample I.D.	B20SB−1D	(1) B20SB−1D 01	B20SB−2D	B−20SB−2E	B−20SB−3D	B20SB−4D	B20SB−4D	B20SB−5B	B20SB−5B	B20SB−5E	B20SB−6B
Laboratory	(R)	(R)	(R)	(R)	(R)	(R)	(L)	(R)	(L)	(R)	(R)
Sample Date	06−20−94	06−20−94	06−20−94	06−20−94	06−20−94	07−06−94	11−16−94	07−06−94	11−16−94	07−06−94	07−06−94
Sample Depth	(5−7')	(5−7')	(5−7')	(7−9')	(4−6')	(4−6')	(4−6')	(.5−2.5')	(0−2')	(6.5−8.5')	(4.75−6.75')
Fluoranthene	380 U	130 J	480 U	−−	−−	−−	390 U	−−	55000	−−	−−
Fluorene	380 U	370 U	480 U	−−	−−	−−	390 U	−−	28000	−−	−−
Hexachlorobenzene	380 U	370 U	480 U	−−	−−	−−	390 U	−−	750 U	−−	−−
Hexachlorobutadiene	380 U	370 U	480 U	−−	−−	−−	390 U	−−	750 U	−−	−−
Hexachlorocyclopentadiene	380 U	370 U	480 U	−−	−−	−−	390 U	−−	750 U	−−	−−
Hexachloroethane	380 U	370 U	480 U	−−	−−	−−	390 U	−−	750 U	−−	−−
Indeno (1,2,3−cd) pyrene	380 U	370 U	480 U	−−	−−	−−	390 U	−−	11000 R	−−	−−
Isodecyl diphenylphosphate	380 W	370 W	480 W	−−	−−	−−	−−	−−	−−	−−	−−
Isophorone	380 U	370 U	480 U	−−	−−	−−	390 U	−−	750 U	−−	−−
Isothiazolones	380 W	370 W	480 W	−−	−−	−−	−−	−−	−−	−−	−−
Maneb	380 W	370 W	480 W	−−	−−	−−	−−	−−	−−	−−	−−
Methylene Bisthiocyanate	380 W	370 W	480 W	−−	−−	−−	−−	−−	−−	−−	−−
N,N−Dimethylaniline	380 U	370 U	480 U	−−	−−	−−	−−	−−	−−	−−	−−
Naphthalene	380 U	370 U	480 U	−−	−−	−−	390 U	−−	11000	−−	−−
Nitrilotriacetate	380 W	370 W	480 W	−−	−−	−−	−−	−−	−−	−−	−−
Nitrobenzene	380 U	370 U	480 U	−−	−−	−−	390 U	−−	750 U	−−	−−
N−nitrosodiethylamine	380 U	370 U	480 U	−−	−−	−−	−−	−−	−−	−−	−−
N−nitrosodimethylamine	380 U	370 U	480 U	−−	−−	−−	−−	−−	−−	−−	−−
N−nitrosodiphenylamine	380 U	370 U	480 U	−−	−−	−−	390 U	−−	750 U	−−	−−
N−nitrosodi−n−propylamine	380 U	370 U	480 U	−−	−−	−−	390 U	−−	750 U	−−	−−
N−nitrosopyrrolidine	380 U	370 U	480 U	−−	−−	−−	−−	−−	−−	−−	−−
N−nitroso−di−n−butylamine	380 U	370 U	480 U	−−	−−	−−	−−	−−	−−	−−	−−
Pentachlorobenzene	1800 U	1800 U	2300 U	−−	−−	−−	−−	−−	−−	−−	−−
Pentachlorophenol	1800 U	1800 U	2300 UJ	−−	−−	−−	970 U	−−	1900 U	−−	−−
Phenanthrene	380 U	150 J	130 J	−−	−−	−−	390 U	−−	75000	−−	−−
Phenol	380 U	370 U	480 U	−−	−−	−−	390 U	−−	750 U	−−	−−
Propanil	380 W	370 W	480 W	−−	−−	−−	−−	−−	−−	−−	−−
Pyrene	380 U	100 J	480 U	−−	−−	−−	390 U	−−	73000 J	−−	−−
Pyridine	1800 U	1800 U	2300 U	−−	−−	−−	−−	−−	−−	−−	−−
Tetrachloroterephthalic Acid	380 W	370 W	480 W	−−	−−	−−	−−	−−	−−	−−	−−
Total Aminocresols	380 W	370 W	480 W	−−	−−	−−	−−	−−	−−	−−	−−
Zineb	380 W	370 W	480 W	−−	−−	−−	−−	−−	−−	−−	−−
Ziram	380 W	370 W	480 W	−−	−−	−−	−−	−−	−−	−−	−−
SURROGATE RECOVERY (%)											
Nitrobenzene−d5 (23−120)	54	79	56	−−	−−	−−	67	−−	91	−−	−−
2−Fluorobiphenyl (30−115)	70	95	80	−−	−−	−−	70	−−	91	−−	−−
Terphenyl−d14 (18−137)	106	118	83	−−	−−	−−	77	−−	169 D	−−	−−
Phenol−d6 (29−113)	65	74	71	−−	−−	−−	59	−−	75	−−	−−
2−Fluorophenol (25−121)	66	77	46	−−	−−	−−	60	−−	75	−−	−−
2,4,6−Tribromophenol (19−122)	42	34	12 *	−−	−−	−−	71	−−	78	−−	−−
METHOD: SW−846 8080											
PESTICIDES/PCB COMPOUNDS: (µg/kg)											
4,4'−DDD	3.9 U	3.7 U	4.8 U	−−	−−	−−	3.9 U	−−	9.9 J	−−	−−
4,4'−DDE	3.9 U	3.7 U	4.8 U	−−	−−	−−	3.9 U	−−	37 U	−−	−−
4,4'−DDT	3.9 U	3.7 U	4.8 U	−−	−−	−−	3.9 U	−−	37 U	−−	−−
Aldrin	2 U	1.9 U	2.5 U	−−	−−	−−	2 U	−−	7.2 J	−−	−−
Alpha BHC	2 U	1.9 U	2.5 U	−−	−−	−−	2 U	−−	19 U	−−	−−
Alpha Endosulfan	2 U	1.9 U	2.5 U	−−	−−	−−	2 U	−−	19 U	−−	−−
Alpha Chlordane	2 U	1.9 U	2.5 U	−−	−−	−−	2 U	−−	19 U	−−	−−
Beta BHC	2 U	1.9 U	2.5 U	−−	−−	−−	2 U	−−	19 U	−−	−−
Beta Endosulfan	3.9 U	3.7 U	4.8 U	−−	−−	−−	3.9 U	−−	37 U	−−	−−
BHC (Hexachlorocyclohexane) Isomers	2 U	1.9 U	2.5 U	−−	−−	−−	−−	−−	−−	−−	−−
Delta BHC	2 U	1.9 U	2.5 U	−−	−−	−−	2 U	−−	19 U	−−	−−
Dieldrin	3.9 U	3.7 U	4.8 U	−−	−−	−−	3.9 U	−−	37 U	−−	−−
Endosulfan Sulfate	3.9 U	3.7 U	4.8 U	−−	−−	−−	3.9 U	−−	37 U	−−	−−

Table F.1: Analytical Data Summary for Subsurface Soils
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample I.D.	B20SB-1D	B20SB-1D 01 (1)	B20SB-2D	B-20SB-2E	B-20SB-3D	B20SB-4D	B20SB-4D	B20SB-5B	B20SB-5B	B20SB-5E	B20SB-6B
Laboratory	(R)	(R)	(R)	(R)	(R)	(R)	(L)	(R)	(L)	(R)	(R)
Sample Date	06-20-94	06-20-94	06-20-94	06-20-94	06-20-94	07-06-94	11-16-94	07-06-94	11-16-94	07-06-94	07-06-94
Sample Depth	(5-7')	(5-7')	(5-7')	(7-9')	(4-6')	(4-6')	(4-6')	(.5-2.5')	(0-2')	(6.5-8.5')	(4.75-6.75')
Endrin	3.9 U	3.7 U	4.8 U	--	--	--	3.9 U	--	37 U	--	--
Endrin Aldehyde	--	--	--	--	--	--	3.9 U	--	37 U	--	--
Endrin Ketone	3.9 U	3.7 U	4.8 U	--	--	--	3.9 U	--	37 U	--	--
Folpet	20 U	19 U	25 U	--	--	--	--	--	--	--	--
Gamma BHC - Lindane	--	--	--	--	--	--	0.13 J	--	19 UJ	--	--
Gamma Chlordane	2 U	1.9 U	2.5 U	--	--	--	2 U	--	19 U	--	--
Heptachlor	2 U	1.9 U	2.5 U	--	--	--	2 U	--	19 U	--	--
Heptachlor Epoxide	2 U	1.9 U	2.5 U	--	--	--	2 U	--	5.3 J	--	--
Malathion	2 U	1.9 U	2.5 U	--	--	--	--	--	--	--	--
Methoxychlor	20 U	19 U	25 U	--	--	--	20 U	--	190 U	--	--
Mirex	0.95 J	1.9 U	2.5 U	--	--	--	--	--	--	--	--
Parathion, Ethyl	3.9 U	3.7 U	4.8 U	--	--	--	--	--	--	--	--
Parathion, Methyl	3.9 U	3.7 U	4.8 U	--	--	--	--	--	--	--	--
PCB-1016	39 U	37 U	48 U	--	--	--	39 U	--	370 U	--	--
PCB-1221	80 U	76 U	98 U	--	--	--	79 U	--	750 U	--	--
PCB-1232	39 U	37 U	48 U	--	--	--	39 U	--	370 U	--	--
PCB-1242	39 U	37 U	48 U	--	--	--	39 U	--	370 U	--	--
PCB-1248	39 U	37 U	48 U	--	--	--	39 U	--	370 U	--	--
PCB-1254	39 U	37 U	48 U	--	--	--	39 U	--	370 U	--	--
PCB-1260	39 U	37 U	48 U	--	--	--	6.4 J	--	370 U	--	--
Propachlor	39 U	37 U	48 U	--	--	--	--	--	--	--	--
Toxaphene	200 U	190 U	250 U	--	--	--	200 U	--	1900 U	--	--
SURROGATE RECOVERY (%)											
2,4,5,6-Tetrachloro-meta-xylene (40-148)	82	74	62	--	--	--	--	--	--	--	--
Tetrachloro-meta-xylene (50-120)	--	--	--	--	--	--	77	--	45 *	--	--
Decachlorobiphenyl (43-151)	84	88	68	--	--	--	--	--	--	--	--
Decachlorobiphenyl (50-120)	--	--	--	--	--	--	72	--	58	--	--
METALS: (mg/kg)											
Aluminum (3050/6010)	8090	11200	5720	--	--	--	9440	--	8220	--	--
Antimony (3050/6010)	3.5 U	3.4 U	3.2 UJ	--	--	--	23 U	--	22 U	--	--
Arsenic (3050/7060)	2.6	2.9	2.8 J	--	--	--	4.2	--	2.7	--	--
Barium (3050/6010)	38.8	62.2	68	--	--	--	37	--	41	--	--
Beryllium (3050/6010)	0.35 U	0.34 U	0.32 U	--	--	--	0.471 J	--	0.419 J	--	--
Cadmium (3050/6010)	1.2 U	1.1 U	1.1 U	--	--	--	2.3 U	--	2.2 U	--	--
Calcium (3050/6010)	6390	4220	74800	--	--	--	1950	--	34500	--	--
Chromium (3050/6010)	9.2	11.5	27.7 J	--	--	--	9.8	--	15.3	--	--
Cobalt (3050/6010)	5.2	4.8	19.4	--	--	--	5.9	--	5.46 J	--	--
Copper (3050/6010)	8.4 J	1.6 J	9.9	--	--	--	21.7	--	24.2	--	--
Hexavalent Chromium (7195)	0.41	0.21 U	--	0.5	0.22 U	0.39	--	0.58	--	0.23 U	0.22 U
Iron (3050/6010)	15500	16000	17900	--	--	--	18200	--	17300	--	--
Lead (3050/6010)	10.7	12.6	10	--	--	--	6	--	27	--	--
Magnesium (3050/6010)	2570	2380	3980	--	--	--	3070	--	3170	--	--
Manganese (3050/6010)	415	394	723 J	--	--	--	696	--	491	--	--
Mercury (7471)	0.1 U	0.11 U	0.1 U	--	--	--	0.032 J	--	0.041 J	--	--
Molybdenum (3050/7480)	5.8 U	5.6 U	6.4	--	--	--	5.9 U	--	5.6 U	--	--
Nickel (3050/6010)	11.6	11.9	41.6 J	--	--	--	12.8	--	20.6	--	--
Potassium (3050/6010)	883	754	886	--	--	--	921	--	740	--	--
Selenium (3050/7740)	0.36 U	0.35 U	0.31 U	--	--	--	0.76 J	--	1.11 J	--	--
Silver (3050/6010)	1.2 U	1.1 U	6.4 J	--	--	--	0.61 J	--	2.2 U	--	--
Sodium (3050/6010)	163	196	248	--	--	--	68 U	--	598	--	--
Strontium (3050/7780)	12.6	10.8	112	--	--	--	6.55	--	66.7	--	--
Thallium (3050/7841)	0.48 U	0.58 U	0.52 U	--	--	--	2.3 U	--	2.2 U	--	--
Vanadium (3050/6010)	15.8	21.2	12.6	--	--	--	17.1	--	29.7	--	--
Zinc (3050/6010)	35.8	37	35.3	--	--	--	52	--	48	--	--

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Table F.1: Analytical Data Summary for Subsurface Soils
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample I.D.	B20SB-1D	B20SB-1D 01 (1)	B20SB-2D	B-20SB-2E	B-20SB-3D	B20SB-4D	B20SB-4D	B20SB-5B	B20SB-5B	B20SB-5E	B20SB-6B
Laboratory	(R)	(R)	(R)	(R)	(R)	(R)	(L)	(R)	(L)	(R)	(R)
Sample Date	06-20-94	06-20-94	06-20-94	06-20-94	06-20-94	07-06-94	11-16-94	07-06-94	11-16-94	07-06-94	07-06-94
Sample Depth	(5-7')	(5-7')	(5-7')	(7-9')	(4-6')	(4-6')	(4-6')	(.5-2.5')	(0-2')	(6.5-8.5')	(4.75-6.75')
WET CHEMISTRY: (mg/kg)											
% Moisture (160.3)	16.3	14.2	6.8	12	11.5	16.7	14.8	10.1	11	16.1	12.4
Total Cyanide (9010/9012)	1 U	1 U	1 U	--	--	--	0.1 U	--	0.2 U	--	--
Petroleum Hydrocarbons (418.1)	39.8	50.9	61.7	--	--	--	40	--	4400	--	--

(1) = Duplicate of B20SB-1D

Note: Results reported on a dry weight basis
(R) = RECRA Environmental, Inc.
(L) = Lancaster Laboratories, Inc.
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
D = Surrogate diluted out
J = Estimated
R = Rejected
U = Analyte not detected
UJ = Estimated concentration possibly biased low
W = Compound not detected by comparing extracted ion profile against NIST library
-- = Analyte not analyzed
* = Value outside applicable QC limits

PREPARED/DATE: CLC 7/25/95
CHECKED/DATE: DSS 8/2/95

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Table F.2: Analytical Data Summary for Ground Water
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample I.D.	B20MW-1	B20MW-1RE	B20MW-2	(1) B20MW-01	B20MW-3	B20MW-3 RE	TB1-080794	TB2-080894
Laboratory	(L)	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Sample Date	08-07-94	08-07-94	08-08-94	08-08-94	08-07-94	08-07-94	08-07-94	08-08-94
METHOD: EPA 524.2								
VOLATILES: (ug/L)								
1,1,1,2-Tetrachloroethane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
1,1,1-Trichloroethane	0.5 U	--	0.8	0.8	1.4	--	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	0.2 U	--	0.2 U	0.2 U	0.2 U	--	0.2 U	0.2 U
1,1,2-Trichloroethane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
1,1-Dichloroethane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
1,1-Dichloroethene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
1,1-Dichloropropene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
1,2,3-Trichlorobenzene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
1,2,3-Trichloropropane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
1,2,4-Trichlorobenzene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
1,2,4-Trimethylbenzene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
1,2-Dibromo-3-Chloropropane	2 U	--	2 U	2 U	2 U	--	2 U	2 U
1,2-Dibromoethane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
1,2-Dichlorobenzene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.2 J	0.5 U
1,2-Dichloroethane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
1,2-Dichloropropane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
1,3,5-Trimethylbenzene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
1,3-Dichlorobenzene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
1,3-Dichloropropane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
1,4-Dichlorobenzene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
2,2-Dichloropropane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
2-Chlorotoluene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
2-Hexanone	5 U	--	5 U	5 U	5 U	--	0.5 U	5 U
4-Chlorotoluene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Acetone	10 U	--	10 U	10 U	10 U	--	10 U	10 U
Acrolein	10 U	--	10 U	10 U	10 U	--	10 U	10 U
Acrylonitrile	10 U	--	10 U	10 U	10 U	--	10 U	10 U
Benzene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Bromobenzene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.2 U	0.5 U
Bromochloromethane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Bromodichloromethane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Bromoform	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Bromomethane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Carbon Disulfide	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Carbon Tetrachloride	0.4 U	--	0.4 U	0.4 U	0.4 U	--	0.4 U	0.4 U
Chlorobenzene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Chloroethane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Chloroform	0.2 U	--	0.4	0.3	0.5	--	0.6	0.2 U
Chloromethane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Cyanogen Chloride	5 UW	--	5 UW	5 UW	5 UW	--	5 UW	5 UW
Dibromochloromethane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Dibromodichloromethane	5 U	--	5 U	5 U	5 U	--	5 U	5 U
Dibromomethane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Dichlorodifluoromethane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Dichlorofluoromethane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Ethylbenzene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Freon 113	2 U	--	2 U	2 U	2 U	--	2 U	2 U
Hexachlorobutadiene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Isopropylbenzene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Methyl Methacrylate	2 U	--	2 U	2 U	2 U	--	2 U	2 U
Methylene Chloride	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Naphthalene	0.5 U	--	3.7 U	3.4	0.5 U	--	0.5 U	0.5 U
Styrene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Tetrachloroethene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Toluene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Trichloroethene	0.5 U	--	0.5 U	0.5 U	0.4 J	--	0.5 U	0.5 U
Trichlorofluoromethane	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
Vinyl Chloride	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
cis-1,2-Dichloroethene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
cis-1,3-Dichloropropene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
m+p-Xylene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
n-Butylbenzene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
n-Propylbenzene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
o-Xylene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
p-Isopropyltoluene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
sec-Butylbenzene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
tert-Butylbenzene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
trans-1,2-Dichloroethene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
trans-1,3-Dichloropropene	0.5 U	--	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U
SURROGATE RECOVERY (%)								
Bromofluorobenzene (80-120)	93	--	94	89	95	--	85	96
1,2-Dichlorobenzene (80-120)	96	--	92	80	99	--	89	94
METHOD EPA 525.1								
SEMI-VOLATILES: (ug/L)								
1,2-Diphenylhydrazine	10 UR	10 UR	10 UJ	10 UJ	10 UR	--	--	--
2,2',3',4,6-Pentachlorobiphenyl	0.1 UR	0.1 UR	0.1 UJ	0.1 UJ	0.1 UR	--	--	--
2,2',3,3',4,4',6-Heptachlorobiphenyl	0.1 UR	0.1 UR	0.1 UJ	0.1 UJ	0.1 UR	--	--	--
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	0.1 UR	0.1 UR	0.1 UJ	0.1 UJ	0.1 UR	--	--	--
2,2',4,4',5,6'-Hexachlorobiphenyl	0.1 UR	0.1 UR	0.1 UJ	0.1 UJ	0.1 UR	--	--	--
2,2',4,4'-Tetrachlorobiphenyl	0.1 UR	0.1 UR	0.1 UJ	0.1 UJ	0.1 UR	--	--	--

Table F.2: Analytical Data Summary for Ground Water
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample I.D.	B20MW-1	B20MW-1RE	B20MW-2	(1) B20MW-01	B20MW-3	B20MW-3 RE	TB1-080794	TB2-080894
Laboratory	(L)	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Sample Date	08-07-94	08-07-94	08-08-94	08-08-94	08-07-94	08-07-94	08-07-94	08-08-94
2,3-Dichlorobiphenyl	0.1 UR	0.1 UR	0.1 UJ	0.1 UJ	0.1 UR	--	--	--
2,4,5-Trichlorobiphenyl	0.1 UR	0.1 UR	0.1 UJ	0.1 UJ	0.1 UR	--	--	--
2,4,5-Trichlorophenol	50 UR	50 UR	50 UJ	50 UJ	50 UR	--	--	--
2,4,6-Trichlorophenol	50 UR	50 UR	50 UJ	50 UJ	50 UR	--	--	--
2,4-Dichlorophenol	10 UR	10 UR	10 UJ	10 UJ	10 UR	--	--	--
2,4-Dinitrotoluene	50 UR	50 UR	50 UJ	50 UJ	50 UR	--	--	--
2-Amino-p-cresol	100 UR	100 UR	100 R	100 R	100 UR	--	--	--
2-Chlorobiphenyl	0.1 UR	0.1 UR	0.1 UJ	0.1 UJ	0.1 UR	--	--	--
2-Chlorophenol	50 UR	50 UR	50 R	50 R	50 UR	--	--	--
2-Nitrophenol	50 UR	50 UR	50 R	50 R	50 UR	--	--	--
3,3'-Dichlorobenzidine	5 UR	5 UR	5 UJ	5 UJ	5 UR	--	--	--
4-Amino-m-cresol	100 UR	100 UR	100 R	100 R	100 UR	--	--	--
4-Chloro-3-methylphenol	20 UR	20 UR	20 UJ	20 UJ	20 UR	--	--	--
4-Nitrophenol	50 UR	50 UR	50 R	50 R	50 UR	--	--	--
5-Amino-o-cresol	100 WR	100 WR	100 R	100 R	100 WR	--	--	--
Acenaphthylene	0.5 UR	0.5 UR	0.06 J	0.04 J	0.5 UR	--	--	--
Alachlor	1 UR	1 UR	1 UJ	1 UJ	1 UR	--	--	--
Aldrin	1 UR	1 UR	1 UJ	1 UJ	1 UR	--	--	--
alpha-Chlordane	0.2 UR	0.2 UR	0.2 UJ	0.2 UJ	0.2 UR	--	--	--
Anthracene	0.5 UR	0.5 UR	0.06 J	0.2 J	0.5 UR	--	--	--
Atrazine	1 UR	1 UR	1 UJ	1 UJ	1 UR	--	--	--
Benzidine	50 UR	50 UR	50 UJ	50 UJ	50 UR	--	--	--
Benzo(a)anthracene	0.1 UR	0.1 UR	0.2 J	0.2 J	0.07 R	--	--	--
Benzo(a)pyrene	0.2 UR	0.2 UR	0.2 J	0.1 J	0.05 R	--	--	--
Benzo(b)fluoranthene	0.2 UR	0.2 UR	0.2 J	0.2 J	0.1 R	--	--	--
Benzo(g,h,i)perylene	0.5 UR	0.5 UR	0.09 J	0.05 J	0.5 UR	--	--	--
Benzo(k)fluoranthene	0.2 UR	0.2 UR	0.09 J	0.2 UJ	0.2 UR	--	--	--
bis(2-Chloroethyl)ether	50 UR	50 UR	50 R	50 R	50 UR	--	--	--
bis(2-Ethylhexyl)adipate	2 UR	2 UR	2 J	2 UJ	2 UR	--	--	--
bis(2-Ethylhexyl)phthalate	0.6 R	0.5 R	2 U	2 UJ	0.06 R	--	--	--
Butylbenzylphthalate	0.03 R	0.03 R	0.5 UJ	0.5 UJ	0.5 UR	--	--	--
Captan	1 UR	1 UR	1 UJ	1 UJ	1 UR	--	--	--
Chrysene	0.2 UR	0.2 UR	0.3 J	0.2 J	0.09 R	--	--	--
Dibenz(a,h)anthracene	0.3 UR	0.3 UR	0.3 UJ	0.3 UJ	0.3 UR	--	--	--
Diethylphthalate	0.5 UR	0.07 RB	0.5 UJ	0.5 UJ	0.5 UR	--	--	--
Dimethylphthalate	0.5 UR	0.5 UR	0.5 UJ	0.5 UJ	0.5 UR	--	--	--
Di-n-butylphthalete	0.03 R	0.04 R	0.08 J	0.07 J	0.5 R	--	--	--
Endrin	2 UR	2 UR	2 UJ	2 UJ	2 UR	--	--	--
Fluorene	0.5 UR	0.5 UR	1 J	1 J	0.5 UR	--	--	--
gamma-Chlordane	0.2 UR	0.2 UR	0.2 UJ	0.2 UJ	0.2 UR	--	--	--
Heptachlor	2 UR	2 UR	2 UJ	2 UJ	2 UR	--	--	--
Heptachlor epoxide	0.5 UR	0.5 UR	0.5 UJ	0.5 UJ	0.5 UR	--	--	--
Hexachlorobenzene	0.5 UR	0.5 UR	0.5 UJ	0.5 UJ	0.5 UR	--	--	--
Hexachlorocyclopentadiene	0.5 UR	0.5 UR	0.5 UJ	0.5 UJ	0.5 UR	--	--	--
Indeno(1,2,3-cd)pyrene	0.4 UR	0.4 UR	0.09 J	0.06 J	0.4 UR	--	--	--
Lindane	0.5 UR	0.5 UR	0.5 UJ	0.5 UJ	0.5 UR	--	--	--
Methoxychlor	0.5 UR	0.5 UR	0.5 UJ	0.5 UJ	0.5 UR	--	--	--
Nitrobenzene	50 UR	50 UR	50 R	50 R	50 UR	--	--	--
N-Nitrosodiethylamine	50 UR	50 UR	50 R	50 R	50 UR	--	--	--
N-Nitrosodimethylamine	50 UR	50 UR	50 R	50 R	50 UR	--	--	--
N-Nitrosodiphenylamine	10 UR	10 UR	10 UJ	10 UJ	10 UR	--	--	--
N-Nitroso-di-n-butylamine	1 UR	1 UR	1 UJ	1 UJ	1 UR	--	--	--
o-Toluidine	10 UR	10 UR	10 UJ	10 UJ	10 UR	--	--	--
Pentachlorophenol	0.4 UR	0.4 UR	0.4 UJ	0.4 UJ	0.4 UR	--	--	--
Phenanthrene	0.5 UR	0.5 UR	2 J	3 J	0.04 R	--	--	--
Propham	50 UR	50 UR	50 UJ	50 UJ	50 UR	--	--	--
Pyrene	0.5 UR	0.5 UR	0.7 J	1 J	0.2 R	--	--	--
Simazine	1 UR	1 UR	1 UJ	1 UJ	1 UR	--	--	--
Thiram	50 WR	50 WR	50 R	50 R	50 WR	--	--	--
trans-Nonachlor	0.2 UR	0.2 UR	0.2 UJ	0.2 UJ	0.2 UR	--	--	--
SURROGATE RECOVERY (%)								
Perylene-d12 (70-130)	97	77	38 *	40 *	32 *	--	--	--
METHODS: SW-846 8080, 8140; EPA 531.1, 547, 548, 632								
PESTICIDES/PCB COMPOUNDS: (ug/L)								
Aldicarb	2 U	--	2 U	2 U	2 U	--	--	--
Aldicarb sulfone	2 U	--	2 U	2 U	2 U	--	--	--
Aldicarb sulfoxide	2 U	--	2 U	2 U	2 U	--	--	--
Baygon	4 U	--	4 U	4 U	4 U	--	--	--
Bolstar	--	--	--	--	0.1 U	--	--	--
Carbaryl	0.5 J	--	4 U	4 U	4 U	--	--	--
Carbofuran	4 U	--	4 U	4 U	4 U	--	--	--
Carbofuran 3-OH	4 U	--	4 U	4 U	4 U	--	--	--
Coumaphos	--	--	--	--	0.2 J	--	--	--
Demeton-O	--	--	--	--	0.1 U	--	--	--
Demeton-S	--	--	--	--	0.1 U	--	--	--
Diazinon	--	--	--	--	0.1 UJ	--	--	--
Dichlorvos	--	--	--	--	0.05 U	--	--	--
Disulfoton	--	--	--	--	0.05 U	--	--	--
Dursban (Chlorpyrifos)	--	--	--	--	0.1 U	--	--	--
Endothall	20 U	--	20 U	20 U	20 U	--	--	--
Ethoprop	--	--	--	--	0.1 U	--	--	--
Fensulfothion	--	--	--	--	0.5 U	--	--	--

Table F.2: Analytical Data Summary for Ground Water
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample I.D.	B20MW-1	B20MW-1RE	B20MW-2	(1) B20MW-01	B20MW-3	B20MW-3 RE	TB1-080794	TB2-080894
Laboratory	(L)	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Sample Date	08-07-94	08-07-94	08-08-94	08-08-94	08-07-94	08-07-94	08-07-94	08-08-94
Fenthion	- -	- -	- -	- -	0.1 U	- -	- -	- -
Fluometuron	- -	- -	10 U	10 U	10 U	- -	- -	- -
Glyphosate	50 U	- -	50 U	50 U	50 U	- -	- -	- -
Guthion (Azinphos-methyl)	- -	- -	- -	- -	0.5 U	- -	- -	- -
Merphos	- -	- -	- -	- -	1 UJ	- -	- -	- -
Methiocarb	4 U	- -	4 U	4 U	4 U	- -	- -	- -
Methomyl	2 UJ	- -	2 U	2 U	2 UJ	- -	- -	- -
Methyl Parathion	- -	- -	- -	- -	0.2 U	- -	- -	- -
Mevinphos	- -	- -	- -	- -	0.1 U	- -	- -	- -
Naled	- -	- -	- -	- -	1 UJ	- -	- -	- -
Oxamyl	4 U	- -	4 U	4 U	4 U	- -	- -	- -
PCB-1016	1.5 U	- -	1 U	1 U	1 U	- -	- -	- -
PCB-1221	2.5 U	- -	1 U	1 U	1 U	- -	- -	- -
PCB-1232	1.5 U	- -	1 U	1 U	1 U	- -	- -	- -
PCB-1242	1.5 U	- -	1 U	1 U	1 U	- -	- -	- -
PCB-1248	1.5 U	- -	1 U	1 U	1 U	- -	- -	- -
PCB-1254	1.5 U	- -	1 U	1 U	1 U	- -	- -	- -
PCB-1260	1.5 U	- -	1 U	1 U	1 U	- -	- -	- -
Phorate	- -	- -	- -	- -	0.1 U	- -	- -	- -
Ronnel	- -	- -	- -	- -	0.5 U	- -	- -	- -
Stirophos	- -	- -	- -	- -	0.2 U	- -	- -	- -
Tokuthion	- -	- -	- -	- -	0.1 U	- -	- -	- -
Total PCB's	1.5 U	- -	1 U	1 U	1 U	- -	- -	- -
Trichloronate	- -	- -	- -	- -	0.5 U	- -	- -	- -
SURROGATE RECOVERY (%) (SW-846 8080)								
Decachlorobiphenyl (60-120)	85	- -	40 *	42 *	45 *	- -	- -	- -
Tetrachlorometaxylene (60-120)	52 *	- -	60	65	95	- -	- -	- -
SURROGATE RECOVERY (%) (SW-846 8140)								
2-nitro-m-xylene (70-130)	- -	- -	- -	- -	85	- -	- -	- -
METHODS: EPA 504, 507, 508, 515.1								
PESTICIDES/PCB COMPOUNDS: (ug/L)								
1,2-Dibromo-3-chloropropane	0.02 U	- -	0.02 U	0.02 U	0.02 UJ	- -	- -	- -
2,4,5-T	- -	- -	- -	- -	1 UJ	- -	- -	- -
2,4,5-TP	- -	- -	- -	- -	0.5 U	- -	- -	- -
2,4-D	- -	- -	- -	- -	2 U	- -	- -	- -
2,4-DB	- -	- -	- -	- -	5 U	- -	- -	- -
3,5-Dichlorobenzoic acid	- -	- -	- -	- -	2 U	- -	- -	- -
4-Nitrophenol	- -	- -	- -	- -	10 UJ	- -	- -	- -
5-Hydroxydicamba	- -	- -	- -	- -	2 R	- -	- -	- -
Acifluorfen	- -	- -	- -	- -	1 UJ	- -	- -	- -
Alachlor	- -	- -	0.8 U	0.8 U	0.8 UJ	- -	- -	- -
Aldrin	- -	- -	0.05 U	0.05 U	0.05 UJ	- -	- -	- -
Alpha-Chlordane	- -	- -	0.06 U	0.06 U	0.06 U	- -	- -	- -
Alpha-HCH(BHC)	- -	- -	0.05 U	0.05 U	0.05 U	- -	- -	- -
Ametryn	- -	- -	0.5 U	0.5 U	0.5 UJ	- -	- -	- -
Atraton	- -	- -	0.5 U	0.5 U	0.5 UJ	- -	- -	- -
Atrazine	- -	- -	0.6 U	0.6 U	0.6 UJ	- -	- -	- -
Benefin	- -	- -	2 UJ	2 UJ	2 UJ	- -	- -	- -
Bentazon	- -	- -	- -	- -	1 UJ	- -	- -	- -
Beta-HCH(BHC)	- -	- -	0.07 U	0.07 U	0.07 U	- -	- -	- -
Bromacil	- -	- -	0.7 U	0.7 U	0.7 UJ	- -	- -	- -
Butachlor	- -	- -	0.7 U	0.7 U	0.7 UJ	- -	- -	- -
Butylate	- -	- -	0.5 U	0.5 U	0.5 UJ	- -	- -	- -
Carboxin	- -	- -	1 U	1 U	1 UJ	- -	- -	- -
Chloramben	- -	- -	- -	- -	2 R	- -	- -	- -
Chlorobenzilate	- -	- -	5 U	5 U	5 U	- -	- -	- -
Chloroneb	- -	- -	0.044 J	0.045 J	1 U	- -	- -	- -
Chlorothalonil	- -	- -	0.06 U	0.06 U	0.06 U	- -	- -	- -
Chlorpropham	- -	- -	0.6 U	0.6 U	0.6 UJ	- -	- -	- -
Cis-Permethrin	- -	- -	1 U	1 U	1 U	- -	- -	- -
Cycloate	- -	- -	0.5 U	0.5 U	0.5 UJ	- -	- -	- -
DCPA(Dacthal)	- -	- -	0.03 U	0.03 U	0.03 R	- -	- -	- -
Dacthal	- -	- -	- -	- -	0.5 U	- -	- -	- -
Dalapon	- -	- -	- -	- -	2 UJ	- -	- -	- -
Delta-HCH(BHC)	- -	- -	0.05 U	0.05 U	0.05 U	- -	- -	- -
Diazinon	- -	- -	0.4 U	0.4 U	0.4 UJ	- -	- -	- -
Dicamba	- -	- -	- -	- -	0.5 U	- -	- -	- -
Dichlorprop	- -	- -	- -	- -	2 U	- -	- -	- -
Dichlorvos	- -	- -	0.5 U	0.5 U	0.5 UJ	- -	- -	- -
Dieldrin	- -	- -	0.06 U	0.06 U	0.06 U	- -	- -	- -
Dinoseb	- -	- -	- -	- -	1 U	- -	- -	- -
Diphenamid	- -	- -	0.4 U	0.4 U	0.4 UJ	- -	- -	- -
Disulfoton	- -	- -	0.5 U	0.5 U	0.5 UJ	- -	- -	- -
Disulfoton sulfone	- -	- -	0.5 U	0.5 U	0.5 UJ	- -	- -	- -
Disulfoton sulfoxide	- -	- -	0.5 U	0.5 U	0.5 UJ	- -	- -	- -
EPTC	- -	- -	2 U	2 U	2 UJ	- -	- -	- -
Endosulfan I	- -	- -	0.001 J	0.001 J	0.1 U	- -	- -	- -
Endosulfan II	- -	- -	0.2 U	0.2 U	0.2 U	- -	- -	- -
Endosulfan Sulfate	- -	- -	0.5 U	0.5 U	0.5 U	- -	- -	- -
Endrin	- -	- -	0.06 U	0.06 U	0.06 UJ	- -	- -	- -
Endrin Aldehyde	- -	- -	0.1 U	0.1 U	0.1 U	- -	- -	- -

Table F.2: Analytical Data Summary for Ground Water
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample I.D.	B20MW-1	B20MW-1RE	B20MW-2	(1) B20MW-01	B20MW-3	B20MW-3 RE	TB1-080794	TB2-080894
Laboratory	(L)	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Sample Date	08-07-94	08-07-94	08-08-94	08-08-94	08-07-94	08-07-94	08-07-94	08-08-94
Ethoprop	--	--	0.4 U	0.4 U	0.4 UJ	--	--	--
Ethylene dibromide	0.02 U	--	0.02 U	0.02 U	0.02 UJ	--	--	--
Etridiazole	--	--	0.06 U	0.06 U	0.06 U	--	--	--
Fenamiphos	--	--	0.5 U	0.5 U	0.5 UJ	--	--	--
Fenarimol	--	--	0.5 U	0.5 U	0.5 UJ	--	--	--
Fluridone	--	--	6 U	6 U	6 UJ	--	--	--
Folpet	--	--	0.3 UJ	0.3 UJ	0.3 UJ	--	--	--
Gamma-Chlordane	--	--	0.06 U	0.06 U	0.06 U	--	--	--
Gamma-HCH(BHC) - (Lindane)	--	--	0.02 U	0.02 U	0.02 U	--	--	--
Heptachlor	--	--	0.03 U	0.03 U	0.03 UJ	--	--	--
Heptachlor Epoxide	--	--	0.03 U	0.03 U	0.03 U	--	--	--
Hexachlorobenzene (HCB)	--	--	0.02 U	0.02 U	0.02 UJ	--	--	--
Hexazinone	--	--	0.4 U	0.4 U	0.4 UJ	--	--	--
MGK 264	--	--	3 U	3 U	3 UJ	--	--	--
Malathion	--	--	0.2 U	0.2 U	0.2 U	--	--	--
Merphos	--	--	3 U	3 U	3 UJ	--	--	--
Methoxychlor	--	--	0.2 U	0.2 U	0.2 U	--	--	--
Methyl paraoxon	--	--	0.6 U	0.6 U	0.6 UJ	--	--	--
Metolachlor	--	--	0.6 U	0.6 U	0.6 UJ	--	--	--
Metribuzin	--	--	0.7 U	0.7 U	0.7 UJ	--	--	--
Mevinphos	--	--	0.6 U	0.6 U	0.6 UJ	--	--	--
Mirex	--	--	0.1 U	0.1 U	0.1 U	--	--	--
Molinate	--	--	0.2 U	0.2 U	0.2 UJ	--	--	--
Napropamide	--	--	0.5 U	0.5 U	0.5 UJ	--	--	--
Norflurazon	--	--	0.6 U	0.6 U	0.6 UJ	--	--	--
P,P-DDD	--	--	0.06 U	0.06 U	0.06 U	--	--	--
P,P-DDE	--	--	0.06 U	0.06 U	0.06 U	--	--	--
P,P-DDT	--	--	0.1 U	0.1 U	0.1 U	--	--	--
Parathion	--	--	0.3 U	0.3 U	0.3 U	--	--	--
Pebulate	--	--	0.2 U	0.2 U	0.2 UJ	--	--	--
Pentachlorophenol (PCP)	--	--	--	--	0.5 UJ	--	--	--
Picloram	--	--	--	--	0.5 U	--	--	--
Prometon	--	--	0.4 U	0.4 U	0.4 UJ	--	--	--
Prometryn	--	--	0.2 U	0.2 U	0.2 UJ	--	--	--
Pronamide	--	--	0.7 U	0.7 U	0.7 UJ	--	--	--
Propachlor	--	--	1 U	1 U	1 U	--	--	--
Propazine	--	--	0.4 U	0.4 U	0.4 UJ	--	--	--
Simazine	--	--	0.2 U	0.2 U	0.2 UJ	--	--	--
Simetryn	--	--	0.4 U	0.4 U	0.4 UJ	--	--	--
Stirofos	--	--	0.3 U	0.3 U	0.3 UJ	--	--	--
Tebuthiuron	--	--	0.6 U	0.6 U	0.6 UJ	--	--	--
Terbacil	--	--	2 U	2 U	2 UJ	--	--	--
Terbufos	--	--	0.3 U	0.3 U	0.3 UJ	--	--	--
Terbutryn	--	--	0.6 U	0.6 U	0.6 UJ	--	--	--
Toxaphene	--	--	5 U	5 U	5 U	--	--	--
Trans-Permethrin	--	--	1 U	1 U	1 U	--	--	--
Triademefon	--	--	0.6 U	0.6 U	0.6 UJ	--	--	--
Tricyclazole	--	--	0.4 U	0.4 U	0.4 UJ	--	--	--
Trifluralin	--	--	0.006 J	0.06 U	0.06 UJ	--	--	--
Vernolate	--	--	1 U	1 U	1 UJ	--	--	--
SURROGATE RECOVERY (%) (EPA 507)								
2-nitro-m-xylene (70-130)	--	--	72	84	64 *	--	--	--
SURROGATE RECOVERY (%) (EPA 508)								
4,4'-Dichlorobiphenyl (70-130)	--	--	86	90	84	--	--	--
SURROGATE RECOVERY (%) (EPA 515.1)								
2,4-Dichlorophenylacetic Acid (70-130)	--	--	--	--	86	--	--	--
METHOD: EPA 549								
PESTICIDES/PCB COMPOUNDS: (µg/L)								
Diquat	10 UJ	--	10 U	10 U	10 UJ	--	--	--
Paraquat	10 U	--	10 U	10 U	10 U	--	--	--
METALS: (mg/L)								
Aluminum (3005/6010)	0.2 U	--	0.66	0.181 J	0.98 J	1.02	--	--
Antimony (3005/7041)	0.003 U	--	0.003 U	0.003 U	0.0142 J	0.003 U	--	--
Arsenic (3020/7060)	0.0098	--	0.0038 J	0.0046 J	0.0038 J	0.0034 J	--	--
Barium (3005/6010)	0.063	--	0.027	0.024	0.024	0.024	--	--
Beryllium (3005/6010)	0.008 U	--	0.008 U	0.008 U	0.008 U	0.008 U	--	--
Cadmium (3005/6010)	0.01 U	--	0.01 U	0.01 U	0.01 U	0.01 U	--	--
Calcium (3005/6010)	106	--	75.7	75	56.7	54.9	--	--
Chromium (3005/6010)	0.0142 J	--	0.02 U	0.02 U	0.114 J	0.089	--	--
Cobalt (3005/6010)	0.02 U	--	0.02 U	0.02 U	0.02 U	0.02 U	--	--
Copper (3005/6010)	0.01 U	--	0.004 J	0.01 U	0.01	0.01	--	--
Hexavalent Chromium (7196)	0.02 U	--	0.02 U	0.002 J	0.02 U	0.02 U	--	--
Iron (3005/6010)	0.088 J	--	1.34	0.41	2.65 J	2.38	--	--
Lead (3020/7421)	0.0075 U	--	0.0009 J	0.0006 J	0.0011 J	0.0021	--	--
Magnesium (3005/6010)	5.58	--	15.5 J	15 J	12	11.7	--	--
Manganese (3005/6010)	0.088	--	0.816	0.759	0.562 J	0.536	--	--
Mercury (7470)	0.0001 U	--	0.0001 U	0.0001 U	0.0001 U	0.0001 U	--	--
Molybdenum (3005/6010)	0.006 J	--	0.0045 J	0.02 U	0.0107 J	0.0102 J	--	--
Nickel (3005/6010)	0.0144 J	--	0.04 U	0.04 U	0.073	0.057	--	--

Table F.2: Analytical Data Summary for Ground Water
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample I.D.	B20MW-1	B20MW-1RE	B20MW-2	(1) B20MW-01	B20MW-3	B20MW-3 RE	TB1-080794	TB2-080894
Laboratory	(L)	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Sample Date	08-07-94	08-07-94	08-08-94	08-08-94	08-07-94	08-07-94	08-07-94	08-08-94
Potassium (3005/6010)	35.4	--	1.99	1.82	1.98	1.91	--	--
Selenium (3020/7740)	0.0007 J	--	0.0003 J	0.0007 J	0.0012	0.0006 J	--	--
Silver (3005/6010)	0.02 U	--	0.02 U	0.02 U	0.02 U	0.02 U	--	--
Sodium (3005/6010)	384	--	36.8	36.7	52.5	50.7	--	--
Strontium (3005/6010)	0.394	--	0.184	0.186	0.116	0.113	--	--
Thallium (3020/7841)	0.005 J	--	0.0004 J	0.0004 J	0.002 U	0.0008 J	--	--
Vanadium (3005/6010)	0.015 U	--	0.0045 J	0.015 U	0.0039 J	0.0049 J	--	--
Zinc (3005/6010)	0.0084 J	--	0.0061 J	0.0063 J	0.0161 J	0.0094 J	--	--
WET CHEMISTRY: (mg/L)								
Total Cyanide (9012)	--	--	0.005 U	0.005 U	0.005 U	0.005 U	--	--
Petroleum Hydrocarbons (418.1)	0.09 J	--	0.2 U	0.09 J	0.13 J	0.09 J	--	--
METHOD: NYSDOH APC-44								
TOTAL GLYCOLS: (mg/kg)								
Initial Run	0.05 U	--	0.05 U	0.05 U	0.05 U	--	--	0.05 U
Confirmatory Run	--	--	--	--	--	--	--	--

(1) = Duplicate of B20MW-2

(L) = Lancaster Laboratories, Inc.
μg/L = micrograms per liter
mg/L = milligrams per liter
J = Estimated
R = Rejected
RE = Reanalysis
U = Analyte not detected
UJ = Estimated concentration possilby biased low
W = Compound not detected by comparing extracted ion profile against NIST library
-- = Analyte not analyzed
* = Value outside applicable QC limits

PREPARED/DATE: CLC 7/25/95
CHECKED/DATE: DSS 8/2/95

Table F.3: Analytical Data Summary for Ground Water – Spring 1995
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample I.D.	B20MW-1	B20MW-2	(1) B20MW-2-01	B20MW-3
Laboratory	(L)	(L)	(L)	(L)
Sample Date	04-04-95	04-04-95	04-04-95	04-04-95
METHOD: EPA 525.1				
SEMI-VOLATILES: (µg/L)				
1,2-Diphenylhydrazine	11 U	10 U	10 U	10 U
2,2',3,3',4,4',6-Heptachlorobiphenyl	0.1 U	0.1 U	0.1 U	0.1 U
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	0.1 U	0.1 U	0.1 U	0.1 U
2,2',3',4,6-Pentachlorobiphenyl	0.1 U	0.1 U	0.1 U	0.1 U
2,2',4,4',5,6'-Hexachlorobiphenyl	0.1 U	0.1 U	0.1 U	0.1 U
2,2',4,4'-Tetrachlorobiphenyl	0.1 U	0.1 U	0.1 U	0.1 U
2,3-Dichlorobiphenyl	0.1 U	0.1 U	0.1 U	0.1 U
2,4,5-Trichlorobiphenyl	0.1 U	0.1 U	0.1 U	0.1 U
2,4,5-Trichlorophenol	53 U	50 U	50 U	50 U
2,4,6-Trichlorophenol	53 U	50 U	50 U	50 U
2,4-Dichlorophenol	11 UJ	10 UJ	10 UJ	10 UJ
2,4-Dinitrotoluene	53 UJ	50 UJ	50 UJ	50 UJ
2-Amino-p-cresol	110 UR	100 UR	100 UR	100 UR
2-Chlorobiphenyl	0.1 U	0.1 U	0.1 U	0.1 U
2-Chlorophenol	53 UR	50 UR	50 UR	50 U
2-Nitrophenol	53 UR	50 UR	50 UR	50 UR
3,3'-Dichlorobenzidine	5 R	5 U	5 U	5 U
4-Amino-m-cresol	110 UR	100 UR	100 UR	100 UR
4-Chloro-3-methylphenol	21 UJ	20 UJ	20 UJ	20 UJ
4-Nitrophenol	53 UR	50 U	50 UR	50 UR
5-Amino-o-cresol	110 UR	100 U	100 UR	100 UR
Acenaphthylene	0.5 U	0.5 U	0.5 U	0.5 U
Alachlor	1 U	1 U	1 U	1 U
Aldrin	1 U	1 U	1 U	1 U
alpha-Chlordane	0.2 U	0.2 U	0.2 U	0.2 U
Anthracene	0.5 U	0.04 J	0.5 U	0.5 U
Atrazine	1 U	1 U	1 U	1 U
Benzidine	53 U	50 U	50 U	50 U
Benzo(a)anthracene	0.1 U	0.3 J	0.1 J	0.1 U
Benzo(a)pyrene	0.2 U	0.2 J	0.09 J	0.2 U
Benzo(b)fluoranthene	0.2 U	0.4 J	0.1 J	0.2 U
Benzo(g,h,i)perylene	0.5 U	0.2 J	0.06 J	0.5 U
Benzo(k)fluoranthene	0.2 U	0.08 J	0.04 J	0.2 U
bis(2-Chloroethyl)ether	53 UR	50 UR	50 UR	50 UR
bis(2-Ethylhexyl)adipate	2 U	2 U	0.09	2 U
bis(2-Ethylhexyl)phthalate	0.2 U	0.4 U	2 U	0.08 U
Butylbenzylphthalate	0.05 J	0.5 U	0.07 J	0.5 U
Captan	1 U	1 U	1 U	1 U
Chrysene	0.2 U	0.4 J	0.1 J	0.2 U
Dibenz(a,h)anthracene	0.3 U	0.05 J	0.3 U	0.3 U
Diethylphthalate	0.5 U	0.5 U	0.04 J	0.5 U
Dimethylphthalate	0.5 U	0.5 U	0.5 U	0.5 U
Di-n-butylphthalate	0.06	0.04 J	0.05 J	0.5 U
Endrin	2 U	2 U	2 U	2 U
Fluorene	0.5 U	0.07 J	0.08 J	0.5 U
gamma-Chlordane	0.2 U	0.2 U	0.2 U	0.2 U
Heptachlor	2 U	2 U	2 U	2 U
Heptachlor epoxide	0.5 U	0.5 U	0.5 U	0.5 U
Hexachlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U
Hexachlorocyclopentadiene	0.5 U	0.5 U	0.5 U	0.5 U
Indeno(1,2,3-cd)pyrene	0.4 U	0.1 U	0.04 J	0.4 U
Lindane	0.5 U	0.5 U	0.5 U	0.5 U
Methoxychlor	0.5 U	0.5 U	0.5 U	0.5 U
Nitrobenzene	53 UR	50 UR	50 UR	50 UR
N-Nitrosodiethylamine	53 UR	50 UR	50 UR	50 UR
N-Nitrosodimethylamine	53 UR	50 UR	50 UR	50 UR
N-Nitrosodiphenylamine (1)	11 U	10 U	10 U	10 U
N-Nitroso-di-n-butylamine	1 U	1 U	1 U	1 U
o-Toluidine	11 UJ	10 UR	10 UJ	10 UJ
Pentachlorophenol	0.4 U	0.4 U	0.4 U	0.4 U
Phenanthrene	0.5 U	0.2 J	0.06 J	0.5 U
Propham	53 U	50 U	50 U	50 U
Pyrene	0.5 U	0.8 J	0.5 J	0.5 U
Simazine	1 U	1 UJ	1 U	1 U
Thiram	53 UR	50 UR	50 UR	50 UR
trans-Nonachlor	0.2 U	0.2 U	0.2 U	0.2 U

Table F.3: Analytical Data Summary for Ground Water – Spring 1995
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample I.D.	B20MW-1	B20MW-2	(1) B20MW-2-01	B20MW-3
Laboratory	(L)	(L)	(L)	(L)
Sample Date	04-04-95	04-04-95	04-04-95	04-04-95
SURROGATE RECOVERY (%)				
Perylene-d12 (70-130)	93	89	93	94
METHOD: EPA 515.1				
PESTICIDES/PCB COMPOUNDS: (µg/L)				
2,4,5-T	1 U	1 U	1 U	--
2,4,5-TP	0.5 U	0.5 U	0.5 U	--
2,4-D	2 U	2 U	2 U	--
2,4-DB	3 U	3 U	3 U	--
3,5-Dichlorobenzoic acid	0.4 J	2 U	2 U	--
4-Nitrophenol	10 U	10 U	10 U	--
5-Hydroxydicamba	2 U	2 U	2 U	--
Acifluorfen	1 U	1 U	1 U	--
Bentazon	1 U	1 U	1 U	--
Chloramben	2 U	2 U	2 U	--
Dacthal	0.5 U	0.03 J	0.5 U	--
Dalapon	2 U	2 U	2 U	--
Dicamba	0.5 U	0.5 U	0.5 U	--
Dichlorprop	2 U	2 U	2 U	--
Dinoseb	1 U	1 U	1 U	--
Pentachlorophenol (PCP)	0.5 U	0.5 UJ	0.5 U	--
Picloram	0.5 U	0.5 U	0.5 U	--
SURROGATE RECOVERY (%)				
2,4-Dichlorophenylacetic Acid (70-130)	86	103	107	--
METHOD: EPA 507				
PESTICIDES/PCB COMPOUNDS: (µg/L)				
Alachlor	0.8 U	0.8 U	0.8 U	--
Ametryn	0.5 U	0.5 U	0.5 U	--
Atraton	0.5 U	0.5 U	0.5 U	--
Atrazine	0.6 U	0.6 U	0.6 U	--
Benefin	2 U	2 U	2 U	--
Bromacil	0.7 U	0.7 U	0.7 U	--
Butachlor	0.7 U	0.7 U	0.7 U	--
Butylate	0.3 U	0.3 U	0.3 U	--
Carboxin	1 U	1 U	1 U	--
Chlorpropham	0.6 U	0.6 U	0.6 U	--
Cycloate	0.3 U	0.3 U	0.3 U	--
Diazinon	0.4 U	0.4 U	0.4 U	--
Dichlorvos	0.3 U	0.3 U	0.3 U	--
Diphenamid	0.4 U	0.4 U	0.4 U	--
Disulfoton	0.5 U	0.5 U	0.5 U	--
Disulfoton sulfone	0.3 U	0.3 U	0.3 U	--
Disulfoton sulfoxide	0.5 UR	0.5 UR	0.5 UR	--
EPTC	2 U	2 U	2 U	--
Ethoprop	0.4 U	0.4 U	0.4 U	--
Fenamiphos	0.5 U	0.5 U	0.5 U	--
Fenarimol	0.5 U	0.5 U	0.5 U	--
Fluridone	6 U	6 U	6 U	--
Hexazinone	0.4 U	0.4 U	0.4 U	--
MGK 264	3 U	3 U	3 U	--
Merphos	3 U	3 U	3 U	--
Methyl paraoxon	0.6 U	0.6 U	0.6 U	--
Metolachlor	0.6 U	0.6 U	0.6 U	--
Metribuzin	0.7 U	0.7 U	0.7 U	--
Mevinphos	0.6 U	0.6 U	0.6 U	--
Molinate	0.2 U	0.2 U	0.2 U	--
Napropamide	0.5 U	0.5 U	0.5 U	--
Norflurazon	0.6 U	0.6 U	0.6 U	--
Pebulate	0.2 U	0.2 U	0.2 U	--
Prometon	0.4 U	0.4 U	0.4 U	--
Prometryn	0.2 U	0.2 U	0.2 U	--
Pronamide	0.7 U	0.7 U	0.7 U	--
Propazine	0.4 U	0.4 U	0.4 U	--
Simazine	0.2 U	0.2 U	0.2 U	--
Simetryn	0.4 U	0.4 U	0.4 U	--
Stirofos	0.3 U	0.3 U	0.3 U	--
Tebuthiuron	0.6 U	0.6 U	0.6 U	--

Table F.3: Analytical Data Summary for Ground Water – Spring 1995
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Sample I.D. Laboratory Sample Date	B20MW-1 (L) 04-04-95	B20MW-2 (L) 04-04-95	(1) B20MW-2-01 (L) 04-04-95	B20MW-3 (L) 04-04-95
Terbacil	2 U	2 U	2 U	--
Terbufos	0.3 U	0.3 U	0.3 U	--
Terbutryn	0.6 U	0.6 U	0.6 U	--
Triademefon	0.6 U	0.6 U	0.6 U	--
Tricyclazole	0.4 UR	0.4 UR	0.4 UR	--
Vernolate	1 U	1 U	1 U	--
SURROGATE RECOVERY (%)				
2-nitro-m-xylene (70-130)	91	100	96	--
METHOD: EPA 508				
PESTICIDES/PCB COMPOUNDS: (µg/L)				
Aldrin	0.05 U	0.05 U	0.05 U	--
Alpha-Chlordane	0.06 U	0.06 U	0.06 U	--
Alpha-HCH(BHC)	0.05 U	0.05 U	0.05 U	--
Beta-HCH(BHC)	0.07 U	0.07 U	0.07 U	--
Chlorobenzilate	5 U	5 U	5 U	--
Chloroneb	1 U	1 U	1 U	--
Chlorothalonil	0.06 U	0.06 U	0.06 U	--
Cis-Permethrin	1 U	1 U	1 U	--
DCPA(Dacthal)	0.03 U	0.03 U	0.03 U	--
Delta-HCH(BHC)	0.05 U	0.05 U	0.05 U	--
Dieldrin	0.005 J	0.06 U	0.06 U	--
Endosulfan I	0.1 U	0.1 U	0.1 U	--
Endosulfan II	0.2 U	0.2 U	0.2 U	--
Endosulfan Sulfate	0.3 U	0.3 U	0.3 U	--
Endrin	0.06 U	0.06 U	0.06 U	--
Endrin Aldehyde	0.1 U	0.1 U	0.1 U	--
Etridiazole	0.06 U	0.06 U	0.06 U	--
Folpet	0.3 U	0.3 U	0.3 U	--
Gamma-Chlordane	0.06 U	0.06 U	0.06 U	--
Gamma-HCH(BHC) - (Lindane)	0.02 U	0.02 U	0.02 U	--
Heptachlor	0.03 U	0.03 U	0.03 U	--
Heptachlor Epoxide	0.03 U	0.03 U	0.03 U	--
Hexachlorobenzene (HCB)	0.02 U	0.02 U	0.02 U	--
Malathion	0.2 U	0.2 U	0.2 U	--
Methoxychlor	0.2 U	0.2 U	0.2 U	--
Mirex	0.1 U	0.1 U	0.1 U	--
P,P-DDD	0.06 U	0.06 U	0.06 U	--
P,P-DDE	0.06 U	0.06 U	0.06 U	--
P,P-DDT	0.1 U	0.1 U	0.1 U	--
Parathion	0.3 U	0.3 U	0.3 U	--
Propachlor	1 U	1 U	1 U	--
Toxaphene	5 U	5 U	5 U	--
Trans-Permethrin	1 U	1 U	1 U	--
Trifluralin	0.06 U	0.06 U	0.06 U	--
SURROGATE RECOVERY (%)				
4,4'-Dichlorobiphenyl (70-130)	126	124	134	--
METHOD: EPA 632				
PESTICIDES/PCB COMPOUNDS: (µg/L)				
Fluometuron	10 U	10 UJ	10 U	--
WET CHEMISTRY: (mg/L)				
Total Cyanide (9012)	0.005 U	0.005 U	0.005 U	--

(1) = Duplicate for B20MW-2

(L) = Lancaster Laboratories, Inc.
µg/L = micrograms per liter
mg/L = milligrams per liter
J = Estimated concentration
R = Rejected
U = Analyte not detected

PREPARED/DATE: CLC 7/25/95
CHECKED/DATE: DSS 8/2/95

TAB

Appendix G

APPENDIX G

RISK ASSESSMENT CALCULATION TABLES

Building 20 Locomotive Roundhouse

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Table G.1: Calculations of Risk from Soils
Utility Worker – Inhalation of Fugitive Dust
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Parameter	Exposure Point Concentration (mg/kg)	Exposure Value Type [a]	Conversion Factor (kg/m³) [b]	Intake Factor (m³/kg–d) Noncarc. (Adult)	Intake Factor (m³/kg–d) Carcinogen (Lifetime)	Intake (mg/kg–d) [c] Noncarc. (Adult)	Intake (mg/kg–d) [c] Carcinogen (Lifetime)	Administered Toxicity Values Inhalation RfD (mg/kg–d)	Administered Toxicity Values Slope Factor (kg–d/mg)	Adult Hazard Quotient [d] (unitless)	Excess Cancer Risk [e] (unitless)
VOLATILES											
Acetone	0.06	Conc.	1.17E–09	3.05E–02	1.09E–02	2.14E–12	7.65E–13	NA	NA	––	––
Benzene	0.003 J	Conc.	1.17E–09	3.05E–02	1.09E–02	1.07E–13	3.83E–14	1.71E–03	2.90E–02	6.26E–11	1.11E–15
Ethylbenzene	0.01	Conc.	1.17E–09	3.05E–02	1.09E–02	3.57E–13	1.28E–13	2.86E–01	NA	1.25E–12	––
Toluene	0.008	Conc.	1.17E–09	3.05E–02	1.09E–02	2.85E–13	1.02E–13	1.14E–01	NA	2.50E–12	––
Xylene (total)	0.056	Conc.	1.17E–09	3.05E–02	1.09E–02	2.00E–12	7.14E–13	NA	NA	––	––
SEMI–VOLATILES											
2,4–Dimethylphenol	0.13 J	Conc.	1.17E–09	3.05E–02	1.09E–02	4.64E–12	1.66E–12	NA	NA	––	––
2–Methylnaphthalene	29	Conc.	1.17E–09	3.05E–02	1.09E–02	1.03E–09	3.70E–10	NA	NA	––	––
Acenapthene	10	Conc.	1.17E–09	3.05E–02	1.09E–02	3.57E–10	1.28E–10	NA	NA	––	––
Acenaphthylene	1.7	Conc.	1.17E–09	3.05E–02	1.09E–02	6.07E–11	2.17E–11	NA	NA	––	––
Anthracene	9.7	Conc.	1.17E–09	3.05E–02	1.09E–02	3.46E–10	1.24E–10	NA	NA	––	––
Benzo(a)anthracene	31 J	Conc.	1.17E–09	3.05E–02	1.09E–02	1.11E–09	3.95E–10	NA	NA	––	––
Benzo (a) pyrene	0.052 J	Conc.	1.17E–09	3.05E–02	1.09E–02	1.86E–12	6.63E–13	NA	NA	––	––
Benzo(b)fluoranthene	0.067 J	Conc.	1.17E–09	3.05E–02	1.09E–02	2.39E–12	8.54E–13	NA	NA	––	––
Benzo(k)fluoranthene	0.036 J	Conc.	1.17E–09	3.05E–02	1.09E–02	1.28E–12	4.59E–13	NA	NA	––	––
bis(2–Ethylhexyl)phthalate	0.19 J	Conc.	1.17E–09	3.05E–02	1.09E–02	6.78E–12	2.42E–12	NA	NA	––	––
Carbazole	4.5	Conc.	1.17E–09	3.05E–02	1.09E–02	1.61E–10	5.74E–11	NA	NA	––	––
Chrysene	38 J	Conc.	1.17E–09	3.05E–02	1.09E–02	1.36E–09	4.85E–10	NA	NA	––	––
Dibenzofuran	5	Conc.	1.17E–09	3.05E–02	1.09E–02	1.78E–10	6.38E–11	NA	NA	––	––
Fluoranthene	55	Conc.	1.17E–09	3.05E–02	1.09E–02	1.96E–09	7.01E–10	NA	NA	––	––
Fluorene	28	Conc.	1.17E–09	3.05E–02	1.09E–02	9.99E–10	3.57E–10	NA	NA	––	––
Naphthalene	11	Conc.	1.17E–09	3.05E–02	1.09E–02	3.93E–10	1.40E–10	NA	NA	––	––
Phenanthrene	75	Conc.	1.17E–09	3.05E–02	1.09E–02	2.68E–09	9.56E–10	NA	NA	––	––
Pyrene	73 J	Conc.	1.17E–09	3.05E–02	1.09E–02	2.61E–09	9.31E–10	NA	NA	––	––
PESTICIDES/PCBs											
4,4'–DDD	0.0099 J	Conc.	1.17E–09	3.05E–02	1.09E–02	3.53E–13	1.26E–13	NA	NA	––	––
Aldrin	0.0072 J	Conc.	1.17E–09	3.05E–02	1.09E–02	2.57E–13	9.18E–14	NA	1.71E+01	––	1.57E–12
gamma–BHC	0.00013 J	Conc.	1.17E–09	3.05E–02	1.09E–02	4.64E–15	1.66E–15	NA	NA	––	––
Heptachlor epoxide	0.0053 J	Conc.	1.17E–09	3.05E–02	1.09E–02	1.89E–13	6.76E–14	NA	9.10E+00	––	6.15E–13
Mirex	0.00095 J	Conc.	1.17E–09	3.05E–02	1.09E–02	3.39E–14	1.21E–14	NA	NA	––	––
PCB–1260	0.0064 J	Conc.	1.17E–09	3.05E–02	1.09E–02	2.28E–13	8.16E–14	NA	NA	––	––
METALS											
Chromium	27.7 J	Conc.	1.17E–09	3.05E–02	1.09E–02	9.88E–10	3.53E–10	NA	NA	––	––
Chromium, hexavalent	0.58	Conc.	1.17E–09	3.05E–02	1.09E–02	2.07E–11	7.40E–12	NA	4.10E+01	––	3.03E–10
Cobalt	19.4	Conc.	1.17E–09	3.05E–02	1.09E–02	6.92E–10	2.47E–10	5.71E–06	NA	1.21E–04	––
Molybdenum	6.4	Conc.	1.17E–09	3.05E–02	1.09E–02	2.28E–10	8.16E–11	NA	NA	––	––
Selenium	1.11 J	Conc.	1.17E–09	3.05E–02	1.09E–02	3.96E–11	1.42E–11	NA	NA	––	––
Silver	6.4 J	Conc.	1.17E–09	3.05E–02	1.09E–02	2.28E–10	8.16E–11	2.86E–06	NA	7.99E–05	––
Strontium	112	Conc.	1.17E–09	3.05E–02	1.09E–02	4.00E–09	1.43E–09	NA	NA	––	––
									TOTAL:	0.0002	3E–10

–– Not calculable
NA – Not available or applicable
a – "Conc." refers to the maximum detected concentration.
b – Conversion factor (ambient air concentration) from Wind Erosion Model (see Table G.7)
c – Intake = Exposure Point Concentration * Conversion Factor * Intake Factor
d – Hazard Quotient = Intake/RfD
e – Excess Cancer Risk (Carcinogens) = Intake * Slope Factor

PREPARED/DATE: TMS 7/21/95
CHECKED/DATE: LAS 8/2/95

Table G.2: Calculations of Risk from Soils
Utility Worker – Dermal Contact With Soils
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Parameter	Exposure Point Concentration (mg/kg)	Exposure Value Type [a]	Intake Factor (kg/kg–d) Noncarc. (Adult)	Intake Factor (kg/kg–d) Carcinogen (Lifetime)	Intake (mg/kg–d) [b] Noncarc. (Adult)	Intake (mg/kg–d) [b] Carcinogen (Lifetime)	Administered Toxicity Values Oral RfD (mg/kg–d)	Administered Toxicity Values Slope Factor (kg–d/mg)	Adult Hazard Quotient [c] (unitless)	Excess Cancer Risk [d] (unitless)
PESTICIDES/PCBs										
PCB–1260	0.0064 J	Conc.	2.81E–07	1.00E–07	1.80E–09	6.40E–10	NA	7.70E+00	––	4.93E–09
								TOTAL:	––	5E–09

–– Not calculable
NA – Not available or applicable
a – "Conc." refers to the maximum detected concentration.
b – Intake = Exposure Point Concentration * Intake Factor
c – Hazard Quotient = Intake/RfD
d – Excess Cancer Risk (Carcinogens) = Slope Factor * Intake

PREPARED/DATE: TMS 7/21/95
CHECKED/DATE: LAS 8/2/95

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Table G.3: Calculations of Risk from Soils
Utility Worker – Incidental Ingestion of Soils
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Parameter	Exposure Point Concentration (mg/kg)	Exposure Value Type [a]	Intake Factor (kg/kg-d) Noncarc. (Adult)	Intake Factor (kg/kg-d) Carcinogen (Lifetime)	Intake (mg/kg-d) [b] Noncarc. (Adult)	Intake (mg/kg-d) [b] Carcinogen (Lifetime)	Administered Toxicity Values Oral RfD (mg/kg-d)	Administered Toxicity Values Slope Factor (kg-d/mg)	Adult Hazard Quotient [c] (unitless)	Excess Cancer Risk [d] (unitless)
VOLATILES										
Acetone	0.06	Conc.	1.53E-07	5.45E-08	9.18E-09	3.27E-09	1.00E-01	NA	9.18E-08	--
Benzene	0.003 J	Conc.	1.53E-07	5.45E-08	4.59E-10	1.64E-10	3.00E-04	2.90E-02	1.53E-06	4.74E-12
Ethylbenzene	0.01	Conc.	1.53E-07	5.45E-08	1.53E-09	5.45E-10	1.00E-01	NA	1.53E-08	--
Toluene	0.008	Conc.	1.53E-07	5.45E-08	1.22E-09	4.36E-10	2.00E-01	NA	6.12E-09	--
Xylene (total)	0.056	Conc.	1.53E-07	5.45E-08	8.57E-09	3.05E-09	2.00E+00	NA	4.28E-09	--
SEMI-VOLATILES										
2,4-Dimethylphenol	0.13 J	Conc.	1.53E-07	5.45E-08	1.99E-08	7.09E-09	2.00E-02	NA	9.95E-07	--
2-Methylnaphthalene	29	Conc.	1.53E-07	5.45E-08	4.44E-06	1.58E-06	NA	NA	--	--
Acenapthene	10	Conc.	1.53E-07	5.45E-08	1.53E-06	5.45E-07	6.00E-02	NA	2.55E-05	--
Acenaphthylene	1.7	Conc.	1.53E-07	5.45E-08	2.60E-07	9.27E-08	NA	NA	--	--
Anthracene	9.7	Conc.	1.53E-07	5.45E-08	1.48E-06	5.29E-07	3.00E-01	NA	4.95E-06	--
Benzo(a)anthracene	31 J	Conc.	1.53E-07	5.45E-08	4.74E-06	1.69E-06	NA	7.30E-01	--	1.23E-06
Benzo (a) pyrene	0.052 J	Conc.	1.53E-07	5.45E-08	7.96E-09	2.83E-09	NA	7.30E+00	--	2.07E-08
Benzo(b)fluoranthene	0.067 J	Conc.	1.53E-07	5.45E-08	1.03E-08	3.65E-09	NA	7.30E-01	--	2.67E-09
Benzo(k)fluoranthene	0.036 J	Conc.	1.53E-07	5.45E-08	5.51E-09	1.96E-09	NA	7.30E-02	--	1.43E-10
bis(2-Ethylhexyl)phthalate	0.19 J	Conc.	1.53E-07	5.45E-08	2.91E-08	1.04E-08	2.00E-02	1.40E-02	1.45E-06	1.45E-10
Carbazole	4.5	Conc.	1.53E-07	5.45E-08	6.89E-07	2.45E-07	NA	2.00E-02	--	4.91E-09
Chrysene	38 J	Conc.	1.53E-07	5.45E-08	5.81E-06	2.07E-06	NA	7.30E-03	--	1.51E-08
Dibenzofuran	5	Conc.	1.53E-07	5.45E-08	7.65E-07	2.73E-07	4.00E-03	NA	1.91E-04	--
Fluoranthene	55	Conc.	1.53E-07	5.45E-08	8.42E-06	3.00E-06	4.00E-02	NA	2.10E-04	--
Fluorene	28	Conc.	1.53E-07	5.45E-08	4.28E-06	1.53E-06	4.00E-02	NA	1.07E-04	--
Naphthalene	11	Conc.	1.53E-07	5.45E-08	1.68E-06	6.00E-07	4.00E-02	NA	4.21E-05	--
Phenanthrene	75	Conc.	1.53E-07	5.45E-08	1.15E-05	4.09E-06	NA	NA	--	--
Pyrene	73 J	Conc.	1.53E-07	5.45E-08	1.12E-05	3.98E-06	3.00E-02	NA	3.72E-04	--
PESTICIDES/PCBs										
4,4'-DDD	0.0099 J	Conc.	1.53E-07	5.45E-08	1.51E-09	5.40E-10	NA	2.40E-01	--	1.29E-10
Aldrin	0.0072 J	Conc.	1.53E-07	5.45E-08	1.10E-09	3.92E-10	3.00E-05	1.70E+01	3.67E-05	6.67E-09
gamma-BHC	0.00013 J	Conc.	1.53E-07	5.45E-08	1.99E-11	7.09E-12	3.00E-04	1.30E+00	6.63E-08	9.21E-12
Heptachlor epoxide	0.0053 J	Conc.	1.53E-07	5.45E-08	8.11E-10	2.89E-10	1.30E-05	9.10E+00	6.24E-05	2.63E-09
Mirex	0.00095 J	Conc.	1.53E-07	5.45E-08	1.45E-10	5.18E-11	2.00E-04	NA	7.27E-07	--
PCB-1260	0.0064 J	Conc.	1.53E-07	5.45E-08	9.79E-10	3.49E-10	NA	7.70E+00	--	2.69E-09
METALS										
Chromium	27.7 J	Conc.	1.53E-07	5.45E-08	4.24E-06	1.51E-06	1.00E+00	NA	4.24E-06	--
Chromium, hexavalent	0.58	Conc.	1.53E-07	5.45E-08	8.87E-08	3.16E-08	5.00E-03	NA	1.77E-05	--
Cobalt	19.4	Conc.	1.53E-07	5.45E-08	2.97E-06	1.06E-06	6.00E-02	NA	4.95E-05	--
Molybdenum	6.4	Conc.	1.53E-07	5.45E-08	9.79E-07	3.49E-07	5.00E-03	NA	1.96E-04	--
Selenium	1.11 J	Conc.	1.53E-07	5.45E-08	1.70E-07	6.05E-08	5.00E-03	NA	3.40E-05	--
Silver	6.4 J	Conc.	1.53E-07	5.45E-08	9.79E-07	3.49E-07	5.00E-03	NA	1.96E-04	--
Strontium	112	Conc.	1.53E-07	5.45E-08	1.71E-05	6.10E-06	6.00E-01	NA	2.86E-05	--
								TOTAL:	0.001	1E-06

-- Not calculable
NA – Not available or applicable
a – "Conc." refers to the maximum detected concentration.
b – Intake = Exposure Point Concentration * Intake Factor
c – Hazard Quotient = Intake/RfD
d – Excess Cancer Risk (Carcinogens) = Intake * Slope Factor

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Table G.4: Calculations of Risk from Soils
Construction Worker – Inhalation of Fugitive Dust
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Parameter	Exposure Point Concentration (mg/kg)	Exposure Value Type [a]	Conversion Factor (kg/m^3) [b]	Intake Factor (m^3/kg–d) Noncarc. (Adult)	Intake Factor (m^3/kg–d) Carcinogen (Lifetime)	Intake (mg/kg–d) [c] Noncarc. (Adult)	Intake (mg/kg–d) [c] Carcinogen (Lifetime)	Administered Toxicity Values Inhalation RfD (mg/kg–d)	Administered Toxicity Values Slope Factor (kg–d/mg)	Adult Hazard Quotient [d] (unitless)	Excess Cancer Risk [e] (unitless)
VOLATILES											
Acetone	0.06	Conc.	1.17E–09	1.96E–01	2.80E–03	1.38E–11	1.97E–13	NA	NA	--	--
Benzene	0.003 J	Conc.	1.17E–09	1.96E–01	2.80E–03	6.88E–13	9.83E–15	1.71E–03	2.90E–02	4.02E–10	2.85E–16
Ethylbenzene	0.01	Conc.	1.17E–09	1.96E–01	2.80E–03	2.29E–12	3.28E–14	2.86E–01	NA	8.02E–12	--
Toluene	0.008	Conc.	1.17E–09	1.96E–01	2.80E–03	1.83E–12	2.62E–14	1.14E–01	NA	1.61E–11	--
Xylene (total)	0.056	Conc.	1.17E–09	1.96E–01	2.80E–03	1.28E–11	1.83E–13	NA	NA	--	--
SEMI–VOLATILES											
2,4–Dimethylphenol	0.13 J	Conc.	1.17E–09	1.96E–01	2.80E–03	2.98E–11	4.26E–13	NA	NA	--	--
2–Methylnaphthalene	29	Conc.	1.17E–09	1.96E–01	2.80E–03	6.65E–09	9.50E–11	NA	NA	--	--
Acenapthene	10	Conc.	1.17E–09	1.96E–01	2.80E–03	2.29E–09	3.28E–11	NA	NA	--	--
Acenaphthylene	1.7	Conc.	1.17E–09	1.96E–01	2.80E–03	3.90E–10	5.57E–12	NA	NA	--	--
Anthracene	9.7	Conc.	1.17E–09	1.96E–01	2.80E–03	2.22E–09	3.18E–11	NA	NA	--	--
Benzo(a)anthracene	31 J	Conc.	1.17E–09	1.96E–01	2.80E–03	7.11E–09	1.02E–10	NA	NA	--	--
Benzo (a) pyrene	0.052 J	Conc.	1.17E–09	1.96E–01	2.80E–03	1.19E–11	1.70E–13	NA	NA	--	--
Benzo(b)fluoranthene	0.067 J	Conc.	1.17E–09	1.96E–01	2.80E–03	1.54E–11	2.19E–13	NA	NA	--	--
Benzo(k)fluoranthene	0.036 J	Conc.	1.17E–09	1.96E–01	2.80E–03	8.26E–12	1.18E–13	NA	NA	--	--
bis(2–Ethylhexyl)phthalate	0.19 J	Conc.	1.17E–09	1.96E–01	2.80E–03	4.36E–11	6.22E–13	NA	NA	--	--
Carbazole	4.5	Conc.	1.17E–09	1.96E–01	2.80E–03	1.03E–09	1.47E–11	NA	NA	--	--
Chrysene	38 J	Conc.	1.17E–09	1.96E–01	2.80E–03	8.71E–09	1.24E–10	NA	NA	--	--
Dibenzofuran	5	Conc.	1.17E–09	1.96E–01	2.80E–03	1.15E–09	1.64E–11	NA	NA	--	--
Fluoranthene	55	Conc.	1.17E–09	1.96E–01	2.80E–03	1.26E–08	1.80E–10	NA	NA	--	--
Fluorene	28	Conc.	1.17E–09	1.96E–01	2.80E–03	6.42E–09	9.17E–11	NA	NA	--	--
Naphthalene	11	Conc.	1.17E–09	1.96E–01	2.80E–03	2.52E–09	3.60E–11	NA	NA	--	--
Phenanthrene	75	Conc.	1.17E–09	1.96E–01	2.80E–03	1.72E–08	2.46E–10	NA	NA	--	--
Pyrene	73 J	Conc.	1.17E–09	1.96E–01	2.80E–03	1.67E–08	2.39E–10	NA	NA	--	--
PESTICIDES/PCBs											
4,4'–DDD	0.0099 J	Conc.	1.17E–09	1.96E–01	2.80E–03	2.27E–12	3.24E–14	NA	NA	--	--
Aldrin	0.0072 J	Conc.	1.17E–09	1.96E–01	2.80E–03	1.65E–12	2.36E–14	NA	1.71E+01	--	4.03E–13
gamma–BHC	0.00013 J	Conc.	1.17E–09	1.96E–01	2.80E–03	2.98E–14	4.26E–16	NA	NA	--	--
Heptachlor epoxide	0.0053 J	Conc.	1.17E–09	1.96E–01	2.80E–03	1.22E–12	1.74E–14	NA	9.10E+00	--	1.58E–13
Mirex	0.00095 J	Conc.	1.17E–09	1.96E–01	2.80E–03	2.18E–13	3.11E–15	NA	NA	--	--
PCB–1260	0.0064 J	Conc.	1.17E–09	1.96E–01	2.80E–03	1.47E–12	2.10E–14	NA	NA	--	--
METALS											
Chromium	27.7 J	Conc.	1.17E–09	1.96E–01	2.80E–03	6.35E–09	9.07E–11	NA	NA	--	--
Chromium, hexavalent	0.58	Conc.	1.17E–09	1.96E–01	2.80E–03	1.33E–10	1.90E–12	NA	4.10E+01	--	7.79E–11
Cobalt	19.4	Conc.	1.17E–09	1.96E–01	2.80E–03	4.45E–09	6.36E–11	5.71E–06	NA	7.79E–04	--
Molybdenum	6.4	Conc.	1.17E–09	1.96E–01	2.80E–03	1.47E–09	2.10E–11	NA	NA	--	--
Selenium	1.11 J	Conc.	1.17E–09	1.96E–01	2.80E–03	2.55E–10	3.64E–12	NA	NA	--	--
Silver	6.4 J	Conc.	1.17E–09	1.96E–01	2.80E–03	1.47E–09	2.10E–11	2.86E–06	NA	5.13E–04	--
Strontium	112	Conc.	1.17E–09	1.96E–01	2.80E–03	2.57E–08	3.67E–10	NA	NA	--	--
									TOTAL:	0.001	8E–11

NA – Not available or applicable
a – "Conc." refers to the maximum detected concentration.
b – Conversion factor from Wind Erosion Model (see Table G.7)
c – Intake = Exposure Point Concentration * Conversion Factor * Intake Factor
d – Hazard Quotient = Intake/RfD
e – Excess Cancer Risk (Carcinogens) = Intake * Slope Factor

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Table G.5: Calculations of Risk from Soils
Construction Worker – Dermal Contact With Soils
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Parameter	Exposure Point Concentration (mg/kg)	Exposure Value Type [a]	Intake Factor (kg/kg–d) Noncarc. (Adult)	Intake Factor (kg/kg–d) Carcinogen (Lifetime)	Intake (mg/kg–d) [b] Noncarc. (Adult)	Intake (mg/kg–d) [b] Carcinogen (Lifetime)	Administered Toxicity Values Oral RfD (mg/kg–d)	Administered Toxicity Values Slope Factor (kg–d/mg)	Adult Hazard Quotient [c] (unitless)	Excess Cancer Risk [d] (unitless)
PESTICIDES/PCBs										
PCB–1260	0.0064 J	Conc.	1.80E–06	2.57E–08	1.15E–08	1.64E–10	NA	7.70E+00	– –	1.27E–09
								TOTAL:	– –	1E–09

– – Not calculable
NA – Not available or applicable
a – "Conc." refers to the maximum detected concentration.
b – Intake = Exposure Point Concentration * Intake Factor
c – Hazard Quotient = Intake/RfD
d – Excess Cancer Risk (Carcinogens) = Slope Factor * Intake

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Table G.6: Calculations of Risk from Soils
Construction Worker – Incidental Ingestion of Soils
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Parameter	Exposure Point Concentration (mg/kg)	Exposure Value Type[a]	Intake Factor (kg/kg–d) Noncarc. (Adult)	Intake Factor (kg/kg–d) Carcinogen (Lifetime)	Intake (mg/kg–d)[b] Noncarc. (Adult)	Intake (mg/kg–d)[b] Carcinogen (Lifetime)	Administered Toxicity Values Oral RfD (mg/kg–d)	Administered Toxicity Values Slope Factor (kg–d/mg)	Adult Hazard Quotient[c] (unitless)	Excess Cancer Risk[d] (unitless)
VOLATILES										
Acetone	0.06	Conc.	4.70E–06	6.71E–08	2.82E–07	4.03E–09	1.00E–01	NA	2.82E–06	––
Benzene	0.003 J	Conc.	4.70E–06	6.71E–08	1.41E–08	2.01E–10	3.00E–04	2.90E–02	4.70E–05	5.84E–12
Ethylbenzene	0.01	Conc.	4.70E–06	6.71E–08	4.70E–08	6.71E–10	1.00E–01	NA	4.70E–07	––
Toluene	0.008	Conc.	4.70E–06	6.71E–08	3.76E–08	5.37E–10	2.00E–01	NA	1.88E–07	––
Xylene (total)	0.056	Conc.	4.70E–06	6.71E–08	2.63E–07	3.76E–09	2.00E+00	NA	1.32E–07	––
SEMI–VOLATILES										
2,4–Dimethylphenol	0.13 J	Conc.	4.70E–06	6.71E–08	6.11E–07	8.72E–09	2.00E–02	NA	3.06E–05	––
2–Methylnaphthalene	29	Conc.	4.70E–06	6.71E–08	1.36E–04	1.95E–06	NA	NA	––	––
Acenapthene	10	Conc.	4.70E–06	6.71E–08	4.70E–05	6.71E–07	6.00E–02	NA	7.83E–04	––
Acenaphthylene	1.7	Conc.	4.70E–06	6.71E–08	7.99E–06	1.14E–07	NA	NA	––	––
Anthracene	9.7	Conc.	4.70E–06	6.71E–08	4.56E–05	6.51E–07	3.00E–01	NA	1.52E–04	––
Benzo(a)anthracene	31 J	Conc.	4.70E–06	6.71E–08	1.46E–04	2.08E–06	NA	7.30E–01	––	1.52E–06
Benzo (a) pyrene	0.052 J	Conc.	4.70E–06	6.71E–08	2.44E–07	3.49E–09	NA	7.30E+00	––	2.55E–08
Benzo(b)fluoranthene	0.067 J	Conc.	4.70E–06	6.71E–08	3.15E–07	4.50E–09	NA	7.30E–01	––	3.28E–09
Benzo(k)fluoranthene	0.036 J	Conc.	4.70E–06	6.71E–08	1.69E–07	2.42E–09	NA	7.30E–02	––	1.76E–10
bis(2–Ethylhexyl)phthalate	0.19 J	Conc.	4.70E–06	6.71E–08	8.93E–07	1.27E–08	2.00E–02	1.40E–02	4.47E–05	1.78E–10
Carbazole	4.5	Conc.	4.70E–06	6.71E–08	2.12E–05	3.02E–07	NA	2.00E–02	––	6.04E–09
Chrysene	38 J	Conc.	4.70E–06	6.71E–08	1.79E–04	2.55E–06	NA	7.30E–03	––	1.86E–08
Dibenzofuran	5	Conc.	4.70E–06	6.71E–08	2.35E–05	3.36E–07	4.00E–03	NA	5.88E–03	––
Fluoranthene	55	Conc.	4.70E–06	6.71E–08	2.59E–04	3.69E–06	4.00E–02	NA	6.46E–03	––
Fluorene	28	Conc.	4.70E–06	6.71E–08	1.32E–04	1.88E–06	4.00E–02	NA	3.29E–03	––
Naphthalene	11	Conc.	4.70E–06	6.71E–08	5.17E–05	7.38E–07	4.00E–02	NA	1.29E–03	––
Phenanthrene	75	Conc.	4.70E–06	6.71E–08	3.53E–04	5.03E–06	NA	NA	––	––
Pyrene	73 J	Conc.	4.70E–06	6.71E–08	3.43E–04	4.90E–06	3.00E–02	NA	1.14E–02	––
PESTICIDES/PCBs										
4,4'–DDD	0.0099 J	Conc.	4.70E–06	6.71E–08	4.65E–08	6.64E–10	NA	2.40E–01	––	1.59E–10
Aldrin	0.0072 J	Conc.	4.70E–06	6.71E–08	3.38E–08	4.83E–10	3.00E–05	1.70E+01	1.13E–03	8.21E–09
gamma–BHC	0.00013 J	Conc.	4.70E–06	6.71E–08	6.11E–10	8.72E–12	3.00E–04	1.30E+00	2.04E–06	1.13E–11
Heptachlor epoxide	0.0053 J	Conc.	4.70E–06	6.71E–08	2.49E–08	3.56E–10	1.30E–05	9.10E+00	1.92E–03	3.24E–09
Mirex	0.00095 J	Conc.	4.70E–06	6.71E–08	4.47E–09	6.37E–11	2.00E–04	NA	2.23E–05	––
PCB–1260	0.0064 J	Conc.	4.70E–06	6.71E–08	3.01E–08	4.29E–10	NA	7.70E+00	––	3.31E–09
METALS										
Chromium	27.7 J	Conc.	4.70E–06	6.71E–08	1.30E–04	1.86E–06	1.00E+00	NA	1.30E–04	––
Chromium, hexavalent	0.58	Conc.	4.70E–06	6.71E–08	2.73E–06	3.89E–08	5.00E–03	NA	5.45E–04	––
Cobalt	19.4	Conc.	4.70E–06	6.71E–08	9.12E–05	1.30E–06	6.00E–02	NA	1.52E–03	––
Molybdenum	6.4	Conc.	4.70E–06	6.71E–08	3.01E–05	4.29E–07	5.00E–03	NA	6.02E–03	––
Selenium	1.11 J	Conc.	4.70E–06	6.71E–08	5.22E–06	7.45E–08	5.00E–03	NA	1.04E–03	––
Silver	6.4 J	Conc.	4.70E–06	6.71E–08	3.01E–05	4.29E–07	5.00E–03	NA	6.02E–03	––
Strontium	112	Conc.	4.70E–06	6.71E–08	5.26E–04	7.52E–06	6.00E–01	NA	8.77E–04	––
								TOTAL:	0.05	2E–06

–– Not calculable
NA – Not available or applicable
a – "Conc." refers to the maximum detected concentration.
b – Intake = Exposure Point Concentration * Intake Factor
c – Hazard Quotient = Intake/RfD
d – Excess Cancer Risk (Carcinogens) = Intake * Slope Factor

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Table G.7: Calculations of Ambient Air Concentrations of Respirable Particles
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Wind Erosion Model (a):

$N_{10} = RP\,(1-G)\,(U_m/U_t)^3\,F(x)$ $= 0.036\,(1-0)\,(4.03/8.25)^3\,(0.5) = 2.10 \times 10^{-3}$ g/m²–hr

	Value
where: N_{10} = Annual Average Flux Rate (g/m²h)	2.10×10^3 g/m²–hr
RP = Respirable Fraction	0.036 (default)
G = Vegetative Cover (site–specific)	0 (no vegetative cover)
U_m = Mean Annual Wind Speed (m/s) (site–specific)	4.03 m/s (PCGEMS)
U_t = Threshold Velocity of Wind Speed (m/s)	8.25 m/s; calculated below
F(x) = Function Dependent Upon U_t/U_m	0.5

$U_t = U_t^* \left[\frac{U^{z0}}{U^*}\right] = 0.50$ m/s x 16.5 = 8.25 m/s

	Value
where: U_t = Threshold Velocity of Wind Speed (m/s)	8.25 m/s
U_t^* = Threshold Friction Velocity (m/s)	0.5 m/s
$\left[\frac{U^{z0}}{U^*}\right]$ = Ratio of Wind Speed to Friction Velocity	16.5

Box Model (b):

$PM_{10} = (N_{10} * A)/(LS * V * MH * 3600\ s/hr)$
$= (2.10 \times 10^{-3}\ g/m^2{-}h * 130.37\ m^2)/(16.19\ m * 2.015\ m/s * 2m * 3{,}600\ s/hr) = 1.17 \times 10^{-6}\ g/m^3$
$= 1.17 \times 10^{-6}\ g/m^3 * 1 \times 10^{-3}\ kg/g = 1.17 \times 10^{-9}\ kg/m^3$

where:	Value
PM = Ambient Air Concentration of Respirable Particles (kg/m³)	1.17×10^{-9} kg/m³
N_{10} = Annual Average Flux Rate (g/m²–hr)	2.10×10^{-3} g/m²–hr
A = Area of Contamination (m²)	130.37 m²
LS = Length of Contaminated Area Perpendicular to Predominant Wind Direction	16.19 m
V = Velocity of Wind (1/2 average wind speed) (m/s)	2.015 m/s
MH = Mixing Height	2 m
Conversion Factor (s/hr)	3600 s/hr

(a) Cowherd et al. 1985. Cowherd, C., Meleski, G., Englehar, P., and Gillette, D. Rapid Assessment of Exposure to Particulated Emissions from Surface Contamination. Midwest Research Institute, Washington, D.C., USEPA Office of Health and Environmental Assessment, EPA –600/8–85–002

(b) Hwang and Falco, 1986. Hwang, T.S. and Falco, J. W., Estimation or Media Exposures Related to Hazardous Work Facilities. Pollutants in a Multimedia Environment. Plenum Publishing Corporation, New York, NY pp229–264

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Table G.8: Calculations of Risk from Ground Water
Industrial Worker – Inhalation of Volatile Organic Compounds
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Parameter	Exposure Point Concentration (mg/L)	Exposure Value Type[a]	Volatilization Factor (mg/m^3)[b]	Intake Factor (m^3/kg-d) Noncarc. (Adult)	Intake Factor (m^3/kg-d) Carcinogen (Lifetime)	Intake (mg/kg-d)[c] Noncarc. (Adult)	Intake (mg/kg-d)[c] Carcinogen (Lifetime)	Administered Toxicity Values Inhalation RfD (mg/kg-d)	Administered Toxicity Values Slope Factor (kg-d/mg)	Adult Hazard Quotient[d] (unitless)	Excess Cancer Risk[e] (unitless)
VOLATILES											
1,1,1-Trichloroethane	0.0014	Conc.	6.29E-03	4.89E-02	1.75E-02	4.31E-07	1.54E-07	2.86E-01	NA	1.51E-06	--
Acetone	0.003 J	Conc.	6.29E-03	4.89E-02	1.75E-02	9.23E-07	3.30E-07	NA	NA	--	--
Chloroform	0.0004	Conc.	6.29E-03	4.89E-02	1.75E-02	1.23E-07	4.40E-08	NA	8.05E-02	--	3.54E-09
Methylene chloride	0.0015 J	Conc.	6.29E-03	4.89E-02	1.75E-02	4.61E-07	1.65E-07	8.57E-01	1.64E-03	5.38E-07	2.71E-10
Naphthalene	0.0034	Conc.	6.29E-03	4.89E-02	1.75E-02	1.05E-06	3.74E-07	NA	NA	--	--
Trichloroethene	0.0004 J	Conc.	6.29E-03	4.89E-02	1.75E-02	1.23E-07	4.40E-08	NA	6.00E-03	--	2.64E-10
									TOTAL:	2E-06	4E-09

-- Not calculable
NA – Not available or applicable
a – "Conc." refers to the maximum detected concentration.
b – Assumes 100 percent volatilization from ground water while washing a truck (see Volume 1).
c – Intake = Exposure Point Concentration * Volatilization Factor * Intake Factor
d – Hazard Quotient = Intake/RfD
e – Excess Cancer Risk (Carcinogens) = Intake * Slope Factor

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Table G.9: Calculations of Risk from Ground Water
Industrial Worker – Dermal Contact With Chemicals in Ground Water
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Parameter	Exposure Point Concentration (mg/L)	Exposure Value Type [a]	Permeability Coefficient (cm/hr) [b]	Intake Factor (L–hr/kg–d–cm) Noncarc. (Adult)	Intake Factor (L–hr/kg–d–cm) Carcinogen (Lifetime)	Intake (mg/kg–d) [c] Noncarc. (Adult)	Intake (mg/kg–d) [c] Carcinogen (Lifetime)	Administered Toxicity Values Oral RfD (mg/kg–d)	Administered Toxicity Values Slope Factor (kg–d/mg)	Adult Hazard Quotient [d] (unitless)	Excess Cancer Risk [e] (unitless)
VOLATILES											
1,1,1–Trichloroethane	0.0014	Conc.	1.70E–02	6.01E–02	2.15E–02	1.43E–06	5.12E–07	NA	NA	––	––
Acetone	0.003 J	Conc.	5.69E–04	6.01E–02	2.15E–02	1.03E–07	3.67E–08	1.00E–01	NA	1.03E–06	––
Chloroform	0.0004	Conc.	8.90E–03	6.01E–02	2.15E–02	2.14E–07	7.65E–08	1.00E–02	6.10E–03	2.14E–05	4.67E–10
Methylene chloride	0.0015 J	Conc.	4.50E–03	6.01E–02	2.15E–02	4.06E–07	1.45E–07	6.00E–02	7.50E–03	6.76E–06	1.09E–09
Naphthalene	0.0034	Conc.	6.90E–02	6.01E–02	2.15E–02	1.41E–05	5.04E–06	4.00E–02	NA	3.52E–04	––
Trichloroethene	0.0004 J	Conc.	1.60E–02	6.01E–02	2.15E–02	3.85E–07	1.38E–07	6.00E–03	1.10E–02	6.41E–05	1.51E–09
SEMI–VOLATILES											
Acenapthylene	0.00006 J	Conc.	1.74E–01	6.01E–02	2.15E–02	6.27E–07	2.24E–07	NA	NA	––	––
Anthracene	0.0002 J	Conc.	2.25E–01	6.01E–02	2.15E–02	2.70E–06	9.68E–07	3.00E–01	NA	9.02E–06	––
Benzo(a)anthracene	0.0003 J	Conc.	8.10E–01	6.01E–02	2.15E–02	1.46E–05	5.22E–06	NA	7.30E–01	––	3.81E–06
Benzo(a)pyrene	0.0002 J	Conc.	1.20E+00	6.01E–02	2.15E–02	1.44E–05	5.16E–06	NA	7.30E+00	––	3.77E–05
Benzo(b)fluoranthene	0.0004 J	Conc.	1.20E+00	6.01E–02	2.15E–02	2.88E–05	1.03E–05	NA	7.30E–01	––	7.53E–06
Benzo(g,h,i)perylene	0.0002 J	Conc.	4.32E+00	6.01E–02	2.15E–02	5.19E–05	1.86E–05	NA	NA	––	––
Benzo(k)fluoranthene	0.00009 J	Conc.	4.02E+00	6.01E–02	2.15E–02	2.17E–05	7.78E–06	NA	7.30E–02	––	5.68E–07
Benzyl butyl phthalate	0.00007 J	Conc.	5.75E–02	6.01E–02	2.15E–02	2.42E–07	8.65E–08	2.00E–01	NA	1.21E–06	––
Chrysene	0.0004 J	Conc.	8.10E–01	6.01E–02	2.15E–02	1.95E–05	6.97E–06	NA	7.30E–03	––	5.09E–08
Dibenz(ah)anthracene	0.00005 J	Conc.	2.70E+00	6.01E–02	2.15E–02	8.11E–06	2.90E–06	NA	7.30E–01	––	2.12E–06
Di–n–butylphthalate	0.00008 J	Conc.	4.39E–02	6.01E–02	2.15E–02	2.11E–07	7.55E–08	1.00E–01	NA	2.11E–06	––
Diethyl phthalate	0.0027	Conc.	4.80E–03	6.01E–02	2.15E–02	7.79E–07	2.79E–07	8.00E–01	NA	9.74E–07	––
Fluorene	0.001 J	Conc.	1.55E–01	6.01E–02	2.15E–02	9.32E–06	3.33E–06	4.00E–02	NA	2.33E–04	––
Indeno(123–cd)pyrene	0.00009 J	Conc.	1.90E+00	6.01E–02	2.15E–02	1.03E–05	3.68E–06	NA	7.30E–01	––	2.68E–06
Phenanthrene	0.003 J	Conc.	2.30E–01	6.01E–02	2.15E–02	4.15E–05	1.48E–05	NA	NA	––	––
Pyrene	0.001 J	Conc.	3.24E–01	6.01E–02	2.15E–02	1.95E–05	6.97E–06	3.00E–02	NA	6.49E–04	––
bis(2–Ethylhexyl)adipate	0.002 J	Conc.	2.28E–01	6.01E–02	2.15E–02	2.74E–05	9.80E–06	6.00E–01	1.20E–03	4.57E–05	1.18E–08
PESTICIDE/PCBs											
3,5–Dichlorobenzoic Acid	0.0004 J	Conc.	7.30E–03 [g]	6.01E–02	2.15E–02	1.75E–07	6.28E–08	NA	NA	––	––
Carbaryl	0.0003 J	Conc.	5.35E–03	6.01E–02	2.15E–02	9.65E–08	3.45E–08	1.00E–01	NA	9.65E–07	––
Chloroneb	0.000045 J	Conc.	8.07E–02	6.01E–02	2.15E–02	2.18E–07	7.81E–08	NA	NA	––	––
Coumaphos	0.0002 J	Conc.	9.98E–03	6.01E–02	2.15E–02	1.20E–07	4.29E–08	NA	NA	––	––
Dacthal (DCPA)	0.00003 J	Conc.	4.91E–02 [f]	6.01E–02	2.15E–02	8.85E–08	3.17E–08	1.00E–02	NA	8.85E–06	––
Dieldrin	0.000005 J	Conc.	1.60E–02	6.01E–02	2.15E–02	4.81E–09	1.72E–09	5.00E–05	1.60E+01	9.62E–05	2.75E–08
Endosulfan I	0.000001 J	Conc.	2.08E–03	6.01E–02	2.15E–02	1.25E–10	4.47E–11	6.00E–03	NA	2.08E–08	––
Trifluralin	0.000006 J	Conc.	6.83E–02	6.01E–02	2.15E–02	2.46E–08	8.81E–09	7.50E–03	7.70E–03	3.28E–06	6.78E–11

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Table G.9: Calculations of Risk from Ground Water
Industrial Worker – Dermal Contact With Chemicals in Ground Water
Building 20 Locomotive Roundhouse Remedial Investigation
Griffiss Air Force Base, Rome, New York

Parameter	Exposure Point Concentration (mg/L)	Exposure Value Type [a]	Permeability Coefficient (cm/hr) [b]	Intake Factor (L-hr/kg-d-cm) Noncarc. (Adult)	Intake Factor (L-hr/kg-d-cm) Carcinogen (Lifetime)	Intake (mg/kg-d) [c] Noncarc. (Adult)	Intake (mg/kg-d) [c] Carcinogen (Lifetime)	Administered Toxicity Values Oral RfD (mg/kg-d)	Administered Toxicity Values Slope Factor (kg-d/mg)	Adult Hazard Quotient [d] (unitless)	Excess Cancer Risk [e] (unitless)
METALS											
Aluminum	1.02	Conc.	1.00E-03	6.01E-02	2.15E-02	6.13E-05	2.19E-05	1.00E+00	NA	6.13E-05	--
Antimony	0.0142 J	Conc.	1.00E-03	6.01E-02	2.15E-02	8.53E-07	3.05E-07	4.00E-04	NA	2.13E-03	--
Arsenic	0.0098	Conc.	1.00E-03	6.01E-02	2.15E-02	5.89E-07	2.11E-07	3.00E-04	1.50E+00	1.96E-03	3.16E-07
Barium	0.063	Conc.	1.00E-03	6.01E-02	2.15E-02	3.79E-06	1.35E-06	7.00E-02	NA	5.41E-05	--
Chromium,total	0.114 J	Conc.	2.00E-03	6.01E-02	2.15E-02	1.37E-05	4.90E-06	1.00E+00	NA	1.37E-05	--
Copper	0.012	Conc.	1.00E-03	6.01E-02	2.15E-02	7.21E-07	2.58E-07	4.00E-02	NA	1.80E-05	--
Manganese	0.816	Conc.	1.00E-03	6.01E-02	2.15E-02	4.90E-05	1.75E-05	4.60E-02	NA	1.07E-03	--
Nickel	0.276	Conc.	1.00E-04	6.01E-02	2.15E-02	1.66E-06	5.93E-07	2.00E-02	NA	8.29E-05	--
Selenium	0.0012	Conc.	1.00E-03	6.01E-02	2.15E-02	7.21E-08	2.58E-08	5.00E-03	NA	1.44E-05	--
Strontium	0.394	Conc.	1.00E-03	6.01E-02	2.15E-02	2.37E-05	8.47E-06	6.00E-01	NA	3.95E-05	--
Thallium	0.005 J	Conc.	1.00E-03	6.01E-02	2.15E-02	3.01E-07	1.08E-07	8.00E-05	NA	3.76E-03	--
Zinc	0.248 J	Conc.	6.00E-04	6.01E-02	2.15E-02	8.94E-06	3.20E-06	3.00E-01	NA	2.98E-05	--
									TOTAL:	0.01	5E-05

NA – Not available or applicable
a – "Conc." refers to the maximum detected concentration.
b – Dermal Exposure Assessment: Principles and Applications
c – Intake = Exposure Point Concentration * Permeability Coefficient * Intake Factor
d – Hazard Quotient = Intake/RfD
e – Excess Cancer Risk (Carcinogens) = Intake * Slope Factor
f – Kp value is for water.
g – Kp value is for benzoic acid.

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Table G.10: Calculations of Risk from Ground Water
Industrial Workers - Ingestion of Ground Water
Building 20 Locomotive Roundhouse Area Remedial Investigation
Griffiss Air Force Base, Rome, New York

Parameter	Exposure Point Concentration (mg/L)	Exposure Value Type [a]	Intake Factor (L/kg-d) [b] Noncarc. (Adult)	Intake Factor (L/kg-d) [b] Carcinogen (Lifetime)	Intake (mg/kg-d) [c] Noncarc. (Adult)	Intake (mg/kg-d) [c] Carcinogen (Lifetime)	Administered Toxicity Values [d] Oral RfD (mg/kg-d)	Administered Toxicity Values [d] Slope Factor (kg-d/mg)	Adult Hazard Quotient [e] (unitless)	Excess Cancer Risk [f] (unitless)
VOLATILES										
Acetone	0.003 J	Conc.	9.78E-03	3.49E-03	2.93E-05	1.05E-05	1.00E-01	--	2.93E-04	--
Chloroform	0.0004	Conc.	9.78E-03	3.49E-03	3.91E-06	1.40E-06	1.00E-02	6.10E-03	3.91E-04	8.52E-09
Methylene chloride	0.0015 J	Conc.	9.78E-03	3.49E-03	1.47E-05	5.24E-06	6.00E-02	7.50E-03	2.45E-04	3.93E-08
Naphthalene	0.0034	Conc.	9.78E-03	3.49E-03	3.33E-05	1.19E-05	4.00E-02	--	8.31E-04	--
1,1,1-Trichloroethane	0.0014	Conc.	9.78E-03	3.49E-03	1.37E-05	4.89E-06	--	--	--	--
Trichloroethene	0.0004 J	Conc.	9.78E-03	3.49E-03	3.91E-06	1.40E-06	6.00E-03	1.10E-02	6.52E-04	1.54E-08
SEMI-VOLATILES										
Acenaphthylene	0.00006 J	Conc.	9.78E-03	3.49E-03	5.87E-07	2.09E-07	--	--	--	--
Anthracene	0.0002 J	Conc.	9.78E-03	3.49E-03	1.96E-06	6.98E-07	3.00E-01	--	6.52E-06	--
Benzo(a)anthracene	0.0003 J	Conc.	9.78E-03	3.49E-03	2.93E-06	1.05E-06	--	7.30E-01	--	7.64E-07
Benzo(a)pyrene	0.0002 J	Conc.	9.78E-03	3.49E-03	1.96E-06	6.98E-07	--	7.30E+00	--	5.10E-06
Benzo(b)fluoranthene	0.0004 J	Conc.	9.78E-03	3.49E-03	3.91E-06	1.40E-06	--	7.30E-01	--	1.02E-06
Benzo(g,h,i)perylene	0.0002 J	Conc.	9.78E-03	3.49E-03	1.96E-06	6.98E-07	--	--	--	--
Benzo(k)fluoranthene	0.00009 J	Conc.	9.78E-03	3.49E-03	8.80E-07	3.14E-07	--	7.30E-02	--	2.29E-08
Bis(2-ethylhexyl)adipate	0.002 J	Conc.	9.78E-03	3.49E-03	1.96E-05	6.98E-06	6.00E-01	1.20E-03	3.26E-05	8.38E-09
Butylbenzylphthalate	0.00007 J	Conc.	9.78E-03	3.49E-03	6.85E-07	2.44E-07	2.00E-01	--	3.42E-06	--
Chrysene	0.0004 J	Conc.	9.78E-03	3.49E-03	3.91E-06	1.40E-06	--	7.30E-03	--	1.02E-08
Dibenz(a,h)anthracene	0.00005 J	Conc.	9.78E-03	3.49E-03	4.89E-07	1.75E-07	--	7.30E+00	--	1.27E-06
Diethylphthalate	0.0027	Conc.	9.78E-03	3.49E-03	2.64E-05	9.42E-06	8.00E-01	--	3.30E-05	--
Di-n-butyl phthalate	0.00008 J	Conc.	9.78E-03	3.49E-03	7.82E-07	2.79E-07	1.00E-01	--	7.82E-06	--
Fluorene	0.001 J	Conc.	9.78E-03	3.49E-03	9.78E-06	3.49E-06	4.00E-02	--	2.45E-04	--
Indeno(1,2,3-cd)pyrene	0.00009 J	Conc.	9.78E-03	3.49E-03	8.80E-07	3.14E-07	--	7.30E-01	--	2.29E-07
Phenanthrene	0.003 J	Conc.	9.78E-03	3.49E-03	2.93E-05	1.05E-05	--	--	--	--
Pyrene	0.001 J	Conc.	9.78E-03	3.49E-03	9.78E-06	3.49E-06	3.00E-02	--	3.26E-04	--

Table G.10: Calculations of Risk from Ground Water
Industrial Workers - Ingestion of Ground Water
Building 20 Locomotive Roundhouse Area Remedial Investigation
Griffiss Air Force Base, Rome, New York

Parameter	Exposure Point Concentration (mg/L)	Exposure Value Type [a]	Intake Factor (L/kg-d) [b] Noncarc. (Adult)	Intake Factor (L/kg-d) [b] Carcinogen (Lifetime)	Intake (mg/kg-d) [c] Noncarc. (Adult)	Intake (mg/kg-d) [c] Carcinogen (Lifetime)	Administered Toxicity Values [d] Oral RfD (mg/kg-d)	Administered Toxicity Values [d] Slope Factor (kg-d/mg)	Adult Hazard Quotient [e] (unitless)	Excess Cancer Risk [f] (unitless)
PESTICIDES/PCBs										
Carbaryl	0.0003 J	Conc.	9.78E-03	3.49E-03	2.93E-06	1.05E-06	1.00E-01	--	2.93E-05	--
Chloroneb	0.000045 J	Conc.	9.78E-03	3.49E-03	4.40E-07	1.57E-07	--	--	--	--
Coumaphos	0.0002 J	Conc.	9.78E-03	3.49E-03	1.96E-06	6.98E-07	--	--	--	--
Dacthal	0.00003 J	Conc.	9.78E-03	3.49E-03	2.93E-07	1.05E-07	1.00E-02	--	2.93E-05	--
3,5-Dichlorobenzoic acid	0.0004 J	Conc.	9.78E-03	3.49E-03	3.91E-06	1.40E-06	--	--	--	--
Dieldrin	0.000005 J	Conc.	9.78E-03	3.49E-03	4.89E-08	1.75E-08	5.00E-05	1.60E+01	9.78E-04	2.79E-07
Endosulfan I	0.000001 J	Conc.	9.78E-03	3.49E-03	9.78E-09	3.49E-09	6.00E-03	--	1.63E-06	--
Trifluralin	0.000006 J	Conc.	9.78E-03	3.49E-03	5.87E-08	2.09E-08	7.50E-03	7.70E-03	7.82E-06	1.61E-10
TOTAL METALS										
Aluminum	1.02	Conc.	9.78E-03	3.49E-03	9.98E-03	3.56E-03	1.00E+00	--	9.98E-03	--
Antimony	0.0142 J	Conc.	9.78E-03	3.49E-03	1.39E-04	4.96E-05	4.00E-04	--	3.47E-01	--
Arsenic	0.0098	Conc.	9.78E-03	3.49E-03	9.58E-05	3.42E-05	3.00E-04	1.50E+00	3.19E-01	5.13E-05
Barium	0.063	Conc.	9.78E-03	3.49E-03	6.16E-04	2.20E-04	7.00E-02	--	8.80E-03	--
Chromium, total	0.114 J	Conc.	9.78E-03	3.49E-03	1.11E-03	3.98E-04	1.00E+00	--	1.11E-03	--
Copper	0.012	Conc.	9.78E-03	3.49E-03	1.17E-04	4.19E-05	4.00E-02	--	2.93E-03	--
Manganese	0.816	Conc.	9.78E-03	3.49E-03	7.98E-03	2.85E-03	2.30E-02	--	3.47E-01	--
Nickel	0.276	Conc.	9.78E-03	3.49E-03	2.70E-03	9.63E-04	2.00E-02	--	1.35E-01	--
Selenium	0.0012	Conc.	9.78E-03	3.49E-03	1.17E-05	4.19E-06	5.00E-03	--	2.35E-03	--
Strontium	0.394	Conc.	9.78E-03	3.49E-03	3.85E-03	1.38E-03	6.00E-01	--	6.42E-03	--
Thallium	0.005 J	Conc.	9.78E-03	3.49E-03	4.89E-05	1.75E-05	8.00E-05	--	6.11E-01	--
Zinc	0.248 J	Conc.	9.78E-03	3.49E-03	2.43E-03	8.66E-04	3.00E-01	--	8.08E-03	--
								TOTAL:	2	6E-05

-- Not available or applicable
a - "Conc." refers to the maximum detected concentration.
b - Intake Factors from Figure 5.7 of Volume 1
c - Intake = Exposure Point Concentration * Intake Factor
d - Toxicity Values from Table 5.4 of Volume 1
e - Hazard Quotient = Intake/RfD
f - Excess Cancer Risk (Carcinogens) = Intake * Slope Factor

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CHECKED/DATE: EFC 8/29/96

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Table G.11: Ambient Air Concentrations of Volatile Organic Compounds Released from Ground Water During Industrial Use Building 20 Locomotive Roundhouse Remedial Investigation Griffiss Air Force Base, Rome, New York

Emission Rate of Volatile Organic Compounds from Ground Water:

$$Q = FR \times 3.8\ L/gal \times 1\ \mathrm{min}/60 \times CGW = 0.63\ L/\mathrm{sec} \times CGW\ (mg/L)$$

Q = Emission Rate (mg/sec)
FR = Flow Rate of ground water through the hose (assumed 10 gal/min)

CGW = Contaminant concentration in ground water (mg/L)

Concentration of Volatile Organic Compounds:

$$C_{air} = Q/(LS \times V \times M)$$

$$C_{air} = \frac{0.63\ L/\mathrm{sec} \times CGW\ mg/L}{25\ m \times 2.015\ m/\mathrm{sec} \times 2\ m} = 6.29 \times 10^{-3}$$

C_{air} = Constituent concentration in air (mg/m^3)
Q = Emission Rate (mg/sec)
LS = Width dimension of the contaminated area perpendicular to the prevailing wind direction (25 m)
V = Average wind speed in the mixing zone - one-half the average wind speed at the mixing height (2.015 m/s)
M = Mixing height (2 m)

Source: Hwang and Falco, 1986.

PREPARED/DATE: BLG 5/30/95
CHECKED/DATE: LAS 6/15/95

Summary of Reasonable Maximum Exposure Parameters and Intake Factors for Human Health Risk Assessment
Griffiss Air Force Base, Rome, New York

		Recreational				Residential				Agricultural				Occupational				
Exposure Parameters	Symbol	Adult	Adolescent	Youth	Child	Adult	Adolescent	Youth	Child	Adult	Adolescent	Youth	Child	Utility	Flightline Worker	Construction Worker	Landscaper Worker	Industrial Worker
Exposure Frequency (days/year)	EF	175	175	175	175	350	350	350	350	350	350	350	350	39	175	250	175	250
Exposure Duration (years)	ED	30	6	6	6	30	6	6	6	30	6	6	6	25	25	1	25	25
Carcinogens-Adult		12	NA	NA	NA	12	NA	NA	NA	12	NA	NA	NA	NA	NA	NA	NA	NA
Body Weight (kg)	BW	70	61	36	15	70	61	36	15	70	61	36	15	70	70	70	70	70
Averaging Time (days):	AT																	
Noncarcinogens		10,950	2,190	2,190	2,190	10,950	2,190	2,190	2,190	10,950	2,190	2,190	2,190	9,125	9,125	365	9,125	9,125
Carcinogens		25,550	NA	NA	NA	25,550	NA	NA	NA	25,550	NA	NA	NA	25,550	25,550	25,550	25,550	25,550
Conversion Factors																		
Converts milligrams to kilograms (kg/mg)	CF_1	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06
Converts cubic centimeters to liters (L/cm^3)	CF_2	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Incidental Ingestion of Soils: [Intake Factor = IR_s * EF * ED * CF_1 * FI / (BW * AT) (Noncarcinogens); Intake Factor = IR_{adj} * CF_1 * FI / AT (carcinogens)]																		
Soil or Sediment Ingestion Rate (mg/day)	IR_s	100	100	100	200	NA	NA	NA	NA	NA	NA	NA	NA	100	50	480	100	NA
Fraction Ingested from Source (unitless)	FI	1	1	1	1	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1	NA
Age-Adjusted Intake Factor (mg/kg body weight)[1]	IR_{adj}	21638	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor (Noncarcinogens) ($days^{-1}$)		6.85E-07	7.86E-07	1.33E-06	6.39E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.53E-07	3.42E-07	4.70E-06	6.85E-07	NA
Intake Factor (Carcinogens) (day^{-1})		8.47E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.45E-08	1.22E-07	6.71E-08	2.45E-07	NA
Inhalation of Airborne (Vapor Phase) Chemicals: (Intake Factor = InhR * EF * ED / (BW * AT))																		
Inhalation Rate (m^3/day)	InhR	3.9	8.4	8.8	8	20	21	24	16	20	21	24	16	20	20	20	20	NA
Intake Factor (Noncarcinogens) (m^3/kg-day)		2.67E-02	6.60E-02	1.17E-01	2.56E-01	2.74E-01	3.30E-01	6.39E-01	1.02E+00	2.74E-01	3.30E-01	6.39E-01	1.02E+00	3.05E-02	1.37E-01	1.96E-01	1.37E-01	NA
Intake Factor (Carcinogens) (m^3/kg-day)		1.14E-02	NA	NA	NA	1.17E-01	NA	NA	NA	1.17E-01	NA	NA	NA	1.09E-02	4.89E-02	2.80E-03	4.89E-02	NA
Inhalation of Fugitive Dust: (Intake Factor = InhR * EF_{dust} * ED / (BW * AT))																		
Exposure Frequency for Dust (days/year)	EF_{dust}	175	175	175	175	245	245	245	245	245	245	245	245	39	175	250	175	250
Intake Factor (Noncarcinogens) (m^3/kg-day)		2.67E-02	6.60E-02	1.17E-01	2.56E-01	1.92E-01	2.31E-01	4.47E-01	7.16E-01	1.92E-01	2.31E-01	4.47E-01	7.16E-01	3.05E-02	1.37E-01	1.96E-01	1.37E-01	NA
Intake Factor (Carcinogens) (m^3/kg-day)		1.14E-02	NA	NA	NA	8.22E-02	NA	NA	NA	8.22E-02	NA	NA	NA	1.09E-02	4.89E-02	2.80E-03	4.89E-02	NA
Dermal Contact with Soils: (Intake Factor = SA_s * AF * ABS * EF * ED * CF_1 / (BW * AT))																		
Surface Area of Exposed Skin (cm^2/day)	SA_s	5,080	4,944	3,701	1,914	NA	NA	NA	NA	NA	NA	NA	NA	3,070	2,020	3,070	3,070	NA
Soil to Skin Adherence Factor (mg/cm^2)	AF	1	1	1	1	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1	NA
Absorption Factor (unitless):																		
Dioxins	ABS_d	0.03	0.03	0.03	0.03	NA	NA	NA	NA	NA	NA	NA	NA	0.03	0.03	0.03	0.03	NA
Cadmium	ABS_c	0.001	0.001	0.001	0.001	NA	NA	NA	NA	NA	NA	NA	NA	0.001	0.001	0.001	0.001	NA
PCBs	ABS_b	0.06	0.06	0.06	0.06	NA	NA	NA	NA	NA	NA	NA	NA	0.06	0.06	0.06	0.06	NA
Arsenic	ABS_a	0.03	0.03	0.03	0.03	NA	NA	NA	NA	NA	NA	NA	NA	0.03	0.03	0.03	0.03	NA
Pentachlorophenol	ABS_p	0.25	0.25	0.25	0.25	NA	NA	NA	NA	NA	NA	NA	NA	0.25	0.25	0.25	0.25	NA
Intake Factor - Dioxins (Noncarcinogens) (day^{-1})		1.04E-06	1.17E-06	1.48E-06	1.84E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.41E-07	4.15E-07	9.01E-07	6.31E-07	NA
Intake Factor - Dioxins (Carcinogens) (day^{-1})		4.47E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.02E-08	1.48E-07	1.29E-08	2.25E-07	NA
Intake Factor - Cadmium (Noncarcinogens) (day^{-1})		3.48E-08	3.89E-08	4.93E-08	6.12E-08	NA	NA	NA	NA	NA	NA	NA	NA	4.69E-09	1.38E-08	3.00E-08	2.10E-08	NA
Intake Factor - Cadmium (Carcinogens) (day^{-1})		1.49E-08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.67E-09	4.94E-09	4.29E-10	7.51E-09	NA
Intake Factor - PCBs (Noncarcinogens) (day^{-1})		2.09E-06	2.33E-06	2.96E-06	3.67E-06	NA	NA	NA	NA	NA	NA	NA	NA	2.81E-07	8.30E-07	1.80E-06	1.26E-06	NA
Intake Factor - PCBs (Carcinogens) (day^{-1})		8.95E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00E-07	2.96E-07	2.57E-08	4.51E-07	NA
Intake Factor - Arsenic (Noncarcinogens) (day^{-1})		1.04E-06	1.17E-06	1.48E-06	1.84E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.41E-07	4.15E-07	9.01E-07	6.31E-07	NA
Intake Factor - Arsenic (Carcinogens) (day^{-1})		4.47E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.02E-08	1.48E-07	1.29E-08	2.25E-07	NA
Intake Factor - Pentachlorophenol (Noncarcinogens) (day^{-1})		8.70E-06	9.71E-06	1.23E-05	1.53E-05	NA	NA	NA	NA	NA	NA	NA	NA	1.17E-06	3.46E-06	7.51E-06	5.26E-06	NA
Intake Factor - Pentachlorophenol (Carcinogens) (day^{-1})		3.73E-06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.18E-07	1.24E-06	1.07E-07	1.88E-06	NA

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Summary of Reasonable Maximum Exposure Parameters and Intake Factors for Human Health Risk Assessment
Griffiss Air Force Base, Rome, New York

Exposure Parameters	Symbol	Recreational Adult	Recreational Adolescent	Recreational Youth	Recreational Child	Residential Adult	Residential Adolescent	Residential Youth	Residential Child	Agricultural Adult	Agricultural Adolescent	Agricultural Youth	Agricultural Child	Utility	Occupational Flightline Worker	Occupational Construction Worker	Occupational Landscaper Worker	Occupational Industrial Worker
Ingestion of Ground Water: [Intake Factor = (IR_{gw} * EF * ED) / (BW * AT) (Noncarcinogens); Intake Factor = IR_{adj} / AT (carcinogens)]																		
Ingestion Rate of Ground Water (L/day)	IR_{gw}	NA	NA	NA	NA	2	2	2	1	2	2	2	1	NA	NA	NA	NA	1
Age-Adjusted Intake Factor (L/kg)[1]	IR_{adj}	NA	NA	NA	NA	446	NA	NA	NA	446	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor (Noncarcinogens) (L/kg-day)		NA	NA	NA	NA	2.74E-02	3.14E-02	5.33E-02	6.39E-02	2.74E-02	3.14E-02	5.33E-02	6.39E-02	NA	NA	NA	NA	9.78E-03
Intake Factor (carcinogens) (L/kg-day)		NA	NA	NA	NA	1.74E-02	NA	NA	NA	1.74E-02	NA	NA	NA	NA	NA	NA	NA	3.49E-03
Inhalation of Airborne (Vapor Phase) Chemicals from Ground Water while Showering: (Intake Factor = EF * ED / AT)																		
Intake Factor (Noncarcinogens) (unitless)		NA	NA	NA	NA	9.59E-01	9.59E-01	9.59E-01	9.59E-01	9.59E-01	9.59E-01	9.59E-01	9.59E-01	NA	NA	NA	NA	NA
Intake Factor (carcinogens) (unitless)		NA	NA	NA	NA	4.11E-01	NA	NA	NA	4.11E-01	NA	NA	NA	NA	NA	NA	NA	NA
Inhalation of Airborne (Vapor Phase) Chemicals from Ground Water while Truck Washing. [Intake Factor = InhR * ET * EF * ED / (BW * AT)]																		
Inhalation Rate (m^3/hour)	InhR	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5
Exposure Time (hours/day)	ET	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2
Intake Factor (Noncarcinogens) (m^3/kg-day)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.89E-02
Intake Factor (carcinogens) (unitless) (m^3/kg-day)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.75E-02
Dermal Contact with Ground Water: (Intake Factor = SA * ET * EF * ED * CF_2 / (BW * AT))																		
Surface Area of Exposed Skin (cm^2)	SA	NA	NA	NA	NA	18,150	13,550	10,425	7,195	18,150	13,550	10,425	7,195	NA	NA	NA	NA	3,070
Exposure Time (hours/day)	ET	NA	NA	NA	NA	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	NA	NA	NA	NA	2
Intake Factor (Noncarcinogens) (hour-L/kg-day-cm)		NA	NA	NA	NA	6.22E-02	5.33E-02	6.94E-02	1.15E-01	6.22E-02	5.33E-02	6.94E-02	1.15E-01	NA	NA	NA	NA	6.01E-02
Intake Factor (carcinogens) (hour-L/kg-day-cm)		NA	NA	NA	NA	2.66E-02	NA	NA	NA	2.66E-02	NA	NA	NA	NA	NA	NA	NA	2.15E-02
Ingestion of Contaminated Fruits and Vegetables: [Intake Factor = $IngR_v$ * FI_{crop} * EF * ED / (BW * AT) (Noncarcinogens); Intake Factor = IR_{adj} * FI_{crop} / AT (carcinogens)]																		
Ingestion Rate Root Crops (kg/day)	IR_{root}	NA	NA	NA	NA	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.01	NA	NA	NA	NA	NA
Ingestion Rate Leaf/Stem Crops (kg/day)	IR_{leaf}	NA	NA	NA	NA	0.102	0.102	0.102	0.051	0.102	0.102	0.102	0.051	NA	NA	NA	NA	NA
Fraction Ingested from Source (unitless)	FI_{crop}	NA	NA	NA	NA	0.5	0.5	0.5	0.5	0.8	0.8	0.8	0.8	NA	NA	NA	NA	NA
Age-Adjusted Intake Factor - Root Crops (mg/kg)[1]	IR_{adj}	NA	NA	NA	NA	4.46	NA	NA	NA	4.46	NA	NA	NA	NA	NA	NA	NA	NA
Age-Adjusted Intake Factor - Leaf/Stem Crops (mg/kg)[1]	IR_{adj}	NA	NA	NA	NA	22.7	NA	NA	NA	22.7	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor (Noncarcinogens (day^{-1})																		
Root Crops		NA	NA	NA	NA	1.37E-04	1.57E-04	2.66E-04	3.20E-04	2.19E-04	2.52E-04	4.26E-04	5.11E-04	NA	NA	NA	NA	NA
Leaf/Stem Crops		NA	NA	NA	NA	6.99E-04	8.02E-04	1.36E-03	1.63E-03	1.12E-03	1.28E-03	2.17E-03	2.61E-03	NA	NA	NA	NA	NA
Intake Factor (carcinogens) (day^{-1})																		
Root Crops		NA	NA	NA	NA	8.72E-05	NA	NA	NA	1.39E-04	NA	NA	NA	NA	NA	NA	NA	NA
Leaf/Stem Crops		NA	NA	NA	NA	4.45E-04	NA	NA	NA	7.11E-04	NA	NA	NA	NA	NA	NA	NA	NA
Incidental Ingestion of Surface Water: [Intake Factor = IR_{sw} * EF_{sw} * ED / (BW * AT) (Noncarcinogens); Intake Factor = IR_{adj} / AT (carcinogens)]																		
Ingestion Rate of Surface Water (L/event)	IR_{sw}	0.05	0.05	0.05	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Exposure Frequency for Swimming (events/year)	EF_{sw}	26	26	26	26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Age-Adjusted Ingestion Rate for Swimming (L/kg)[1]	IR_{adj}	1.09	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor (Noncarcinogens) (L/kg-day)		5.09E-05	5.84E-05	9.89E-05	2.37E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor (carcinogens) (L/kg-day)		4.26E-05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dermal Contact with Surface Water: [Intake Factor = SA_{sw} * ET * EF_{sw} * ED * CF_2 / (BW * AT)]																		
Surface Area of Exposed Skin (cm^2)	SA_{sw}	3,050	5,628	3,480	2,255	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Exposure Time (hours/event)	ET	1	1	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor (Noncarcinogens) (hour-L/kg-day-cm)		3.10E-03	6.57E-03	6.89E-03	1.07E-02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor (carcinogens) (hour-L/kg-day-cm)		1.33E-03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Summary of Reasonable Maximum Exposure Parameters and Intake Factors for Human Health Risk Assessment
Griffiss Air Force Base, Rome, New York

Exposure Parameters	Symbol	Recreational Adult	Recreational Adolescent	Recreational Youth	Recreational Child	Residential Adult	Residential Adolescent	Residential Youth	Residential Child	Agricultural Adult	Agricultural Adolescent	Agricultural Youth	Agricultural Child	Occupational Utility	Occupational Flightline Worker	Occupational Construction Worker	Occupational Landscaper Worker	Occupational Industrial Worker
Incidental Ingestion of Sediment. [Intake Factor = IR_s * EF_{ss} * FI * ED * CF_1 / (BW * AT) (Noncarcinogens), Intake Factor = IR_{adj} * FI * CF_1 / AT (carcinogens)]																		
Age-Adjusted Intake Factor (mg/kg)[1]	IR_{adj}	3210	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor (Noncarcinogens) (day^{-1})		1.02E-07	1.17E-07	1.98E-07	9.50E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor (carcinogens) (day^{-1})		1.26E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dermal Contact with Sediment: [Intake factor = SA_{ss} * AF * ABS * EF_{ss} * ED * CF_1 / (BW * AT)]																		
Intake Factor - Dioxins (Noncarcinogens) (day^{-1})		9.31E-08	1.97E-07	2.07E-07	3.21E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - Dioxins (Carcinogens) (day^{-1})		3.99E-08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - Cadmium (Noncarcinogens) (day^{-1})		3.10E-09	6.57E-09	6.89E-09	1.07E-08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - Cadmium (Carcinogens) (day^{-1})		1.33E-09	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - PCBs (Noncarcinogens) (day^{-1})		1.86E-07	3.94E-07	4.13E-07	6.43E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - PCBs (Carcinogens) (day^{-1})		7.98E-08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - Arsenic (Noncarcinogens) (day^{-1})		9.31E-08	1.97E-07	2.07E-07	3.21E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - Arsenic (Carcinogens) (day^{-1})		3.99E-08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - Pentachlorophenol (Noncarcinogens) (day^{-1})		7.76E-07	1.64E-06	1.72E-06	2.68E-06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - Pentachlorophenol (Carcinogens) (day^{-1})		3.33E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

1 - Ingestion rates for residential, recreational, and agricultural adults are age-adjusted based on child, youth, adolescent exposures (total 18 years) and a 12-year adult exposure.

$$IR_{adj} = \frac{IR_c \cdot EF_c \cdot ED_c}{BW_c} + \frac{IR_y \cdot EF_y \cdot ED_y}{BW_y} + \frac{IR_{ad} \cdot EF_{ad} \cdot ED_{ad}}{BW_{ad}} + \frac{IR_a \cdot EF_a \cdot ED_a}{BW_a}$$

Subscripts "c", "y", "ad", and "a" denote child, youth, adolescent, and adult, respectively

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Summary of Central Tendency Exposure Parameters and Intake Factors for Human Health Risk Assessment
Griffiss Air Force Base, Rome, New York

Exposure Parameters	Symbol	Recreational Adult	Recreational Adolescent	Recreational Youth	Recreational Child	Residential Adult	Residential Adolescent	Residential Youth	Residential Child	Agricultural Adult	Agricultural Adolescent	Agricultural Youth	Agricultural Child	Occupational Utility	Occupational Flightline Worker	Occupational Construction Worker	Occupational Landscaper Worker	Occupational Industrial Worker
Exposure Frequency (days/year)	EF	175	175	175	175	350	350	350	350	350	350	350	350	39	175	250	175	250
Exposure Duration (years)	ED	30	6	6	6	9	6	6	6	9	6	6	6	10	10	1	10	10
Body Weight (kg)	BW	70	61	36	15	70	61	36	15	70	61	36	15	70	70	70	70	70
Averaging Time (days):	AT																	
Noncarcinogens		10,950	2,190	2,190	2,190	3,285	2,190	2,190	2,190	3,285	2,190	2,190	2,190	3,650	3,650	365	3,650	3,650
Carcinogens		25,550	NA	NA	NA	25,550	NA	NA	NA	25,550	NA	NA	NA	25,550	25,550	25,550	25,550	25,550
Conversion Factors:																		
Converts milligrams to kilograms (kg/mg)	CF_1	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06
Converts cubic centimeters to liters (L/cm^3)	CF_2	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Incidental Ingestion of Soils. [Intake Factor = IR_s * EF * ED * CF_1 * FI / (BW * AT)]																		
Soil or Sediment Ingestion Rate (mg/day)	IR_s	100	100	100	200	NA	NA	NA	NA	NA	NA	NA	NA	100	50	100	100	NA
Fraction Ingested from Source (unitless)	FI	1	1	1	1	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1	NA
Intake Factor (Noncarcinogens) ($days^{-1}$)		6.85E-07	7.86E-07	1.33E-06	6.39E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.53E-07	3.42E-07	9.78E-07	6.85E-07	NA
Intake Factor (Carcinogens) (day^{-1})		2.94E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.18E-08	4.89E-08	1.40E-08	9.78E-08	NA
Dermal Contact with Soils: (Intake Factor = SA_s * AF * ABS * EF * ED * CF_1 / (BW * AT))																		
Surface Area of Exposed Skin (cm^2/day)	SA_s	5,080	4,944	3,701	1,914	NA	NA	NA	NA	NA	NA	NA	NA	3,070	2,020	3,070	3,070	NA
Soil to Skin Adherence Factor (mg/cm^2)	AF	1	1	1	1	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1	NA
Absorption Factor (unitless):																		
Dioxins	ABS_d	0.03	0.03	0.03	0.03	NA	NA	NA	NA	NA	NA	NA	NA	0.03	0.03	0.03	0.03	NA
Cadmium	ABS_c	0.001	0.001	0.001	0.001	NA	NA	NA	NA	NA	NA	NA	NA	0.001	0.001	0.001	0.001	NA
PCBs	ABS_p	0.06	0.06	0.06	0.06	NA	NA	NA	NA	NA	NA	NA	NA	0.06	0.06	0.06	0.06	NA
Arsenic	ABS_a	0.03	0.03	0.03	0.03	NA	NA	NA	NA	NA	NA	NA	NA	0.03	0.03	0.03	0.03	NA
Pentachlorophenol	ABS_p	0.25	0.25	0.25	0.25	NA	NA	NA	NA	NA	NA	NA	NA	0.25	0.25	0.25	0.25	NA
Intake Factor - Dioxins (Noncarcinogens) (day^{-1})		1.04E-06	1.17E-06	1.48E-06	1.84E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.41E-07	4.15E-07	9.01E-07	6.31E-07	NA
Intake Factor - Dioxins (Carcinogens) (day^{-1})		4.47E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.01E-08	5.93E-08	1.29E-08	9.01E-08	NA
Intake Factor - Cadmium (Noncarcinogens) (day^{-1})		3.48E-08	3.89E-08	4.93E-08	6.12E-08	NA	NA	NA	NA	NA	NA	NA	NA	4.69E-09	1.38E-08	3.00E-08	2.10E-08	NA
Intake Factor - Cadmium (Carcinogens) (day^{-1})		1.49E-08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.69E-10	1.98E-09	4.29E-10	3.00E-09	NA
Intake Factor - PCBs (Noncarcinogens) (day^{-1})		2.09E-06	2.33E-06	2.96E-06	3.67E-06	NA	NA	NA	NA	NA	NA	NA	NA	2.81E-07	8.30E-07	1.80E-06	1.26E-06	NA
Intake Factor - PCBs (Carcinogens) (day^{-1})		8.95E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.02E-08	1.19E-07	2.57E-08	1.80E-07	NA
Intake Factor - Arsenic (Noncarcinogens) (day^{-1})		1.04E-06	1.17E-06	1.48E-06	1.84E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.41E-07	4.15E-07	9.01E-07	6.31E-07	NA
Intake Factor - Arsenic (Carcinogens) (day^{-1})		4.47E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.01E-08	5.93E-08	1.29E-08	9.01E-08	NA
Intake Factor - Pentachlorophenol (Noncarcinogens) (day^{-1})		8.70E-06	9.71E-06	1.23E-05	1.53E-05	NA	NA	NA	NA	NA	NA	NA	NA	1.17E-06	3.46E-06	7.51E-06	5.26E-06	NA
Intake Factor - Pentachlorophenol (Carcinogens) (day^{-1})		3.73E-06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.67E-07	4.94E-07	1.07E-07	7.51E-07	NA
Ingestion of Ground Water. [Intake Factor = (IR_{gw} * EF * ED) / (BW * AT)]																		
Ingestion Rate of Ground Water (L/day)	IR_{gw}	NA	NA	NA	NA	1.4	1.4	1.4	0.9	1.4	1.4	1.4	0.9	NA	NA	NA	NA	0.7
Intake Factor (Noncarcinogens) (L/kg-day)		NA	NA	NA	NA	1.92E-02	2.20E-02	3.73E-02	5.75E-02	1.92E-02	2.20E-02	3.73E-02	5.75E-02	NA	NA	NA	NA	6.85E-03
Intake Factor (carcinogens) (L/kg-day)		NA	NA	NA	NA	2.47E-03	NA	NA	NA	2.47E-03	NA	NA	NA	NA	NA	NA	NA	9.78E-04
Inhalation of Airborne (Vapor Phase) Chemicals from Ground Water while Showering: (Intake Factor = EF * ED / AT)																		
Intake Factor (Noncarcinogens) (unitless)		NA	NA	NA	NA	9.59E-01	9.59E-01	9.59E-01	9.59E-01	9.59E-01	9.59E-01	9.59E-01	9.59E-01	NA	NA	NA	NA	NA
Intake Factor (carcinogens) (unitless)		NA	NA	NA	NA	1.23E-01	NA	NA	NA	1.23E-01	NA	NA	NA	NA	NA	NA	NA	NA

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Summary of Central Tendency Exposure Parameters and Intake Factors for Human Health Risk Assessment
Griffiss Air Force Base, Rome, New York

Exposure Parameters	Symbol	Recreational Adult	Recreational Adolescent	Recreational Youth	Recreational Child	Residential Adult	Residential Adolescent	Residential Youth	Residential Child	Agricultural Adult	Agricultural Adolescent	Agricultural Youth	Agricultural Child	Occupational Utility	Occupational Flightline Worker	Occupational Construction Worker	Occupational Landscaper Worker	Occupational Industrial Worker
Inhalation of Airborne (Vapor Phase) Chemicals from Ground Water while Truck Washing: [Intake Factor = InhR * ET * EF * ED / (BW * AT)]																		
Inhalation Rate (m^3/hour)	InhR	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.7
Exposure Time (hours/day)	ET	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2
Intake Factor (Noncarcinogens) (m^3/kg-day)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.33E-02
Intake Factor (carcinogens) (unitless) (m^3/kg-day)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.75E-03
Dermal Contact with Ground Water. (Intake Factor = SA * ET * EF * ED * CF_3 / (BW * AT))																		
Surface Area of Exposed Skin (cm^2)	SA	NA	NA	NA	NA	18,150	13,550	10,425	7,195	18,150	13,550	10,425	7,195	NA	NA	NA	NA	3,070
Exposure Time (hours/day)	ET	NA	NA	NA	NA	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	NA	NA	NA	NA	2
Intake Factor (Noncarcinogens) (hour-L/kg-day-cm)		NA	NA	NA	NA	6.22E-02	5.33E-02	6.94E-02	1.15E-01	6.22E-02	5.33E-02	6.94E-02	1.15E-01	NA	NA	NA	NA	6.01E-02
Intake Factor (carcinogens) (hour-L/kg-day-cm)		NA	NA	NA	NA	7.99E-03	NA	NA	NA	7.99E-03	NA	NA	NA	NA	NA	NA	NA	8.58E-03
Ingestion of Contaminated Fruits and Vegetables: [Intake Factor = $IngR_c$ * FI_{crop} * EF * ED / (BW * AT)]																		
Ingestion Rate Root Crops (kg/day)	IR_{root}	NA	NA	NA	NA	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.01	NA	NA	NA	NA	NA
Ingestion Rate Leaf/Stem Crops (kg/day)	IR_{leaf}	NA	NA	NA	NA	0.102	0.102	0.102	0.051	0.102	0.102	0.102	0.051	NA	NA	NA	NA	NA
Fraction Ingested from Source (unitless)	FI_{crop}	NA	NA	NA	NA	0.5	0.5	0.5	0.5	0.8	0.8	0.8	0.8	NA	NA	NA	NA	NA
Intake Factor (Noncarcinogens (day^{-1}):																		
Root Crops		NA	NA	NA	NA	1.37E-04	1.57E-04	2.66E-04	3.20E-04	2.19E-04	2.52E-04	4.26E-04	5.11E-04	NA	NA	NA	NA	NA
Leaf/Stem Crops		NA	NA	NA	NA	6.99E-04	8.02E-04	1.36E-03	1.63E-03	1.12E-03	1.28E-03	2.17E-03	2.61E-03	NA	NA	NA	NA	NA
Intake Factor (carcinogens) (day^{-1}):																		
Root Crops		NA	NA	NA	NA	1.76E-05	NA	NA	NA	2.82E-05	NA	NA	NA	NA	NA	NA	NA	NA
Leaf/Stem Crops		NA	NA	NA	NA	8.98E-05	NA	NA	NA	1.44E-04	NA	NA	NA	NA	NA	NA	NA	NA
Incidental Ingestion of Sediment: [Intake Factor = IR_s * EF_{sw} * FI * ED * CF_1 / (BW * AT)]																		
Exposure Frequency for Swimming (events/year)	EF_{sw}	26	26	26	26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor (Noncarcinogens) (day^{-1})		1.02E-07	1.17E-07	1.98E-07	9.50E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor (carcinogens) (day^{-1})		4.36E-08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dermal Contact with Sediment: [Intake factor = SA_{sw} * AF * ABS * EF_{sw} * ED * CF_1 / (BW * AT)]																		
Surface Area of Exposed Skin (cm^2)	SA_{sw}	3,050	5,628	3,480	2,255	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - Dioxins (Noncarcinogens) (day^{-1})		9.31E-08	1.97E-07	2.07E-07	3.21E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - Dioxins (Carcinogens) (day^{-1})		3.99E-08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - Cadmium (Noncarcinogens) (day^{-1})		3.10E-09	6.57E-09	6.89E-09	1.07E-08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - Cadmium (Carcinogens) (day^{-1})		1.33E-09	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - PCBs (Noncarcinogens) (day^{-1})		1.86E-07	3.94E-07	4.13E-07	6.43E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - PCBs (Carcinogens) (day^{-1})		7.98E-08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - Arsenic (Noncarcinogens) (day^{-1})		9.31E-08	1.97E-07	2.07E-07	3.21E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - Arsenic (Carcinogens) (day^{-1})		3.99E-08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - Pentachlorophenol (Noncarcinogens) (day^{-1})		7.76E-07	1.64E-06	1.72E-06	2.68E-06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intake Factor - Pentachlorophenol (Carcinogens) (day^{-1})		3.33E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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ADMINISTRATIVE RECORD

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ADMINISTRATIVE RECORD

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Appendix B
(Building 20 AOC Interim Remedial Action Report)

On September 1, 1998, Ocuto received letter from USACE directing that an additional one (1) foot of material be excavated from the base of excavation. Letter also set a new Lead cleanup limit of 400 ppm. This limit was changed from the original contract specification in order to comply with the standard NYS agreed upon Lead limit for the site.

On September 3, 1998, an additional one (1) foot of material was excavated from the base of the excavation. All material excavated on this date was added to the original stockpile. A confirmatory sample was collected from the base of the excavation.

The stockpile was covered and the area secured.

Confirmatory sample results for the sample collected on September 3, 1998 were received on September 16, 1998. Sample results were below new cleanup limits. See Table 3-1, Appendix 1 for summary of results.

On September 24, 1998, the stockpile was sampled for offsite disposal approval. On October 16, 1998 material from the contaminated soil stockpile was loaded for transport to Seneca Meadows for disposal. Loading of contaminated material for transport and disposal at Seneca Meadows was completed on this date.

The excavation was resurveyed to verify additional quantity removed from base of excavation on September 3, 1998. Results of this survey were received on October 22, 1998. The excavation was backfilled and the concrete floor restored, completing work activities at this site.

4. Building 20 Locomotive Roundhouse AOC (SS-23)

4.1 Site Description

This site is located in the south central industrial portion of the base. Building 20 served as a locomotive maintenance facility containing two bays (north and south) with a direct tie-in to the railroads on the base. Building 20 was originally constructed for the United States Air Force, but it has more recently (since the closure of Griffiss Air Force Base) been utilized by a private civilian company that repairs and operates railroad engines and passenger cars. There was soil contamination beneath the floor near the northwest corner of the building.

4.2 Scope of work

The work at this site consisted primarily of saw cutting and removal of concrete, soil excavation, confirmation sampling, transportation and off-site disposal of excavated materials, grouting of abandoned pipelines, plugging and capping of existing floor drains and sumps, backfilling, and concrete restoration.

4.3 Chronology of Work performed

The following chronology describes the work performed at building 20 Locomotive Roundhouse AOC.

Background air monitoring was performed beginning on July 6, 1998 prior to the commencement of work activities at this site.

On August 12, 1998 the civilian railroad company occupying the building was temporarily evacuated while remedial environmental cleanup activities were accomplished. Equipment was mobilized to the site, work zones were established, fences setup, and signs installed. The floor was saw cut in the area of the large excavation in the northwest corner of the building. The concrete was removed and stockpiled on a bermed liner.

On August 13, 1998, the concrete floor was saw cut around the floor drains and the concrete removed. All pipes leading to the northwest and south bay sumps were removed plugged and grouted. Before the sumps were plugged and capped, approximately 5 to 6 gallons of sludge discovered in the south bay sump had to be removed. Although this was not part of the original contract scope, the USACE representative issued verbal instructions to containerize the sludge material that had collected in the south bay sump in two five gallon buckets so that it could be laboratory tested and properly classified for disposal. Also, after the removal of the sludge from the south bay sump, the sump was rinsed with water prior to plugging and capping of the drains occurred. The rinse water was collected and temporarily stored in a metal tub and lined and covered with plastic so that it could be tested in order to determine the appropriate disposal method. The USACE representative advised that the USACE would provide guidance on how to dispose of this sludge material at a later date.

The USACE representative advised that since the testing and disposal of the south bay sump sludge and rinse water were not part of the original contract scope, a contract modification had to be prepared and additional funds requested before this work could take place. The USACE directed that the sludge and rinse water be placed along the north wall inside building 20 and covered with heavy plastic. Two hazardous waste labels were put on each container, assuming the worst case scenario until the waste material could be analyzed.

The contaminated soil was excavated from the large excavation in the north west corner of the site. The excavated material was added to the concrete stockpile on the bermed liner. Confirmatory samples were collected from the excavation.

The excavation was surveyed by a licensed land surveyor to verify the dimensions of the excavation.

Sample results from the confirmatory samples collected on August 13, 1998 were received on August 25, 1998 and compared to the project clean-up limits and NYSDEC

TAGM 4046 Guidance Values. All sample results were below project cleanup limits and TAGM 4046 Guidance values. See Table 4-1, Appendix 1 for summary of results.

On September 1, 1998 authorization to backfill the excavation was received from the USACE.

On September 3, 1998 the large excavation in the north west corner of the building and the sump area was backfilled. The stockpile was sampled for offsite disposal.

On September 10, 1998 a letter was received from the USACE requesting a proposal for sampling and disposal of the sludge material and rinse water temporarily stored in building 20 (proposed change R-0003).

On September 14, 1998, the areas of concrete floor removed to perform the work were restored. On September 15, 1998 the restored concrete was treated with a sealer.

On September 16, 1998 the proposal for change R-0003 requested on September 10, 1998 was submitted to the USACE.

On October 16, 1998, the stockpiled material was loaded for transport to Seneca Meadows for disposal. This completed the original scope of work required at building 20. The site was cleaned up; the sludge and rinse water was left covered and labeled pending authorization to proceed from the USACE.

On October 20, 1998 the owner of the civilian railroad company was notified by the USACE representative that the waste material would be temporarily stored in the building until the contract modification and funds were in place to test and dispose of the waste. The employees of the civilian railroad company were than allowed to return to work in building 20 in late October 1998 after the remedial environmental cleanup work was completed (except for testing and disposal of the sump sludge and rinse water).

On June 28, 1999 received verbal authorization from USACE representative to proceed on sampling and disposal of sludge material and rinse water based on R-0003 proposal submitted on September 16, 1998.

During the period that the additional funds were being sought and the contract modification was being prepared, the waste material in building 20 was periodically inspected. The waste material was observed onsite and intact until early august 1999, when the sludge was discovered missing (both five gallon buckets were onsite but empty). The rinse water was still in place. A search for the missing sludge immediately took place. The owner of the civilian railroad company was questioned and he subsequently questioned his employees about the missing waste material. The owner later responded that he believed the missing sludge material was inadvertently emptied into the container holding the rinse water. However, a later inspection of the rinse water container did not reveal any apparent evidence of the sludge (only the rinse water was observed). A further search of the site both inside the building and outside also did not reveal any evidence of the sludge material.

It became apparent that the sludge material may have been inadvertently thrown into the onsite dumpster during a recent in house cleanup of the building and the waste material subsequently taken to a local waste transfer station before proceeding to a final unknown disposal site. Fortunately, there was enough residual of the sludge material lining the inside of the five-gallon plastic buckets to collect a sample for laboratory testing. This sample of the sludge was collected on August 4, 1999 along with a sample of the rinse water

The analytical results of the sludge and rinse water samples collected on August 4, 1999 were received in late August 1999. The sample results revealed non-hazardous results for both the sludge and rinse water samples. All results from the TCLP run on the sludge sample were below detection limits with the exception of barium (1.2 ppm) and cadmium (0.11 ppm) which were both below reportable limits. The New York State Department of Environmental Conservation was verbally notified of this situation on September 1, 1999.

In view of the small quantity of sludge waste material that was inadvertently disposed of and the relatively benign analytical laboratory results of the sludge material, it does not appear that any release of dangerous waste material to the environment has occurred.

The non-hazardous rinse water was subsequently properly transported and disposed of at Industrial Oil and Tank Service Corporation in late September 1999. This completed the scope of work required at building 20 as specified in the R-0003 contract modification.

5. Building 112 AOC (SS-08)

5.1 Site Description

This site consists of a Rooftop Transformer Rupture Area at the southern portion of the roof, two areas within the Loading Dock Area (the Grassy Area and the Ramp Arêa) with contaminated soils located at the southwest corner of the building, a Tank Containment Area located south of the building, and a PCB Dump Area located south of the building.

5.2 Scope of Work

The work at this site consisted primarily of soil excavation, confirmation sampling, transportation and off-site disposal of excavated materials, backfilling, restoration of asphalt and concrete areas, scarification, and masonry demolition and repair.

5.3 Chronology of Work performed

5.3.1 Soil Excavation and Tank Containment Area Demolition

The following chronology describes the work performed at building 112 AOC. Each different area of the building 112 AOC was dealt with individually so that all contaminated material would be segregated in its own stockpile. Material from each contract cleanup limits for each area of concern. Sample results were also compared to TAGM 4046 soil cleanup objectives.'

TABLE 1-1

Site	*Contaminant*	*Matrix*	*Cleanup limit*
Building 112 AOC	Aroclor 1254	Soil	1 mg/kg - surface 10 mg/kg - Subsurface
	Aroclor 1260	Soil	1 mg/kg - surface 10 mg/kg - Subsurface
	Total PCBs	Wipes	0 1 mg/100cm2
Building 20 AOC	Phenantrene	Soil	50 mg/kg
Building 222 AOC	Antimony	Soil	85 mg/kg
	Lead	Soil	1362 mg/kg *
Building 255 AOC	Trichlorethene	Soil	0.7 mg/kg
	1,2 dichloroethene	Soil	0 3 mg/kg
	1,2-dichlorobenzene	Soil	7 9 mg/kg
	Napthalene	Soil	13 mg/kg
	2-Methylnaphthalene	Soil	36 mg/kg
	Total Chromium	Soil	22 6 mg/kg
	Cyanide	Soil	1 mg/kg
	Lead	Soil	1362 mg/kg *

* Please Note: The cleanup limit for Lead was changed to 400 mg/kg.

QA/QC Sampling and Analysis

Duplicate samples, equipment rinsates and trip blanks were collected for quality assurance/quality control (QA/QC) purposes. Duplicate samples were collected at an approximate frequency of 10 percent. QC duplicate samples were sent to Upstate Laboratories, Inc. along with their associated sample while the QA duplicate samples were sent to the USACE Missouri River Laboratory.

Matrix spike /matrix spike duplicates were collected and analyzed at an approximate frequency of 5 percent.

Equipment rinsate samples were collected through out the project. Equipment rinsates samples were collected by pouring deionized, provided by Upstate laboratories, Inc., over the sampling equipment and collecting the water into appropriate containers for analysis.

A trip blank was placed in each cooler that contained samples designated for VOC analysis. The trip blacks were prepared by Upstate Laboratories, Inc.

Documentation

A label was placed on each sample jar containing the following information: sample ID, sampling date and time, sampler's initials, analysis required, and preservative used (if any). A chain of custody record accompanied each shipment of samples. The chain of custody contained the same information as the sample jars as well as: sample descriptions, turn around times, and project information.

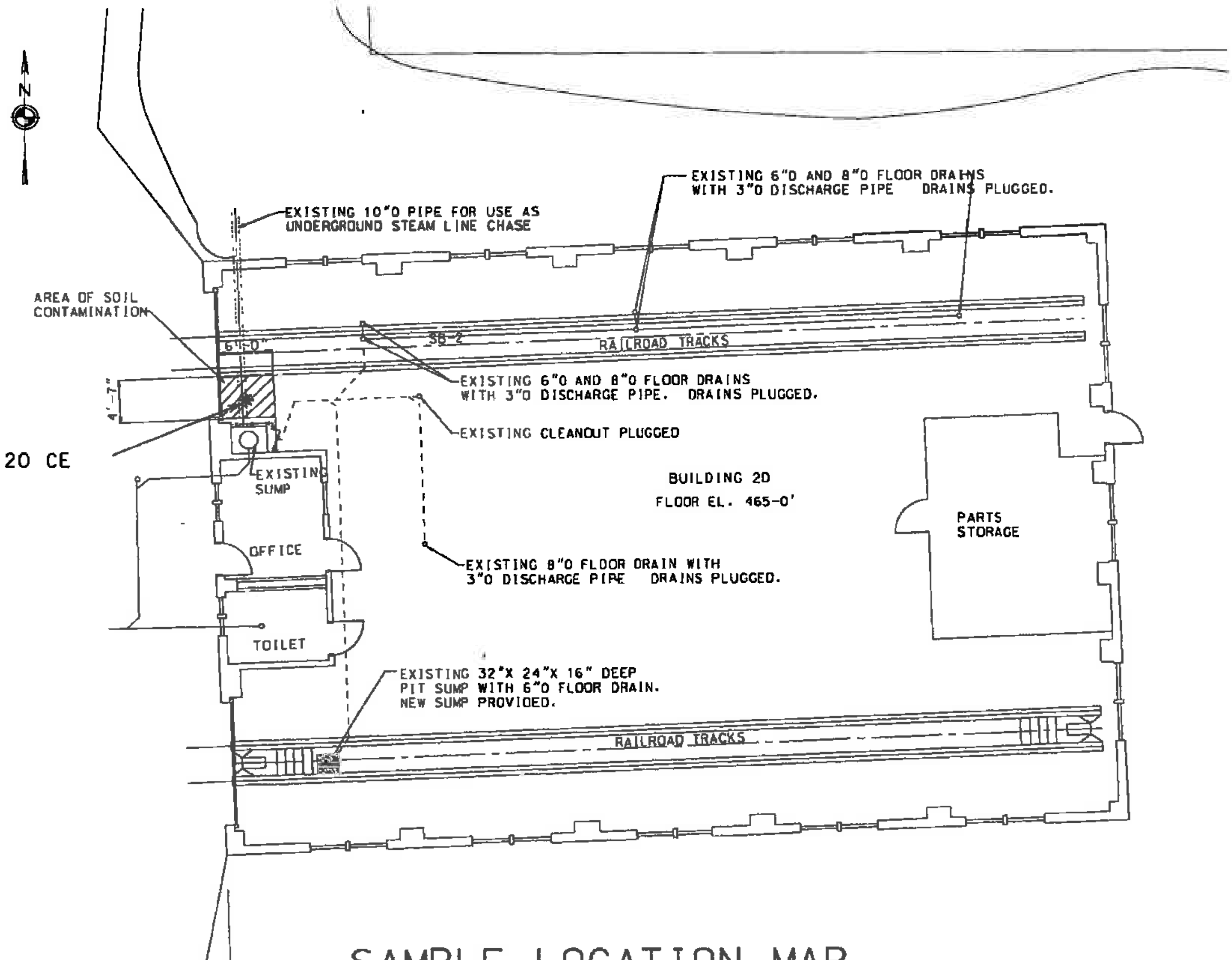
All samples were labeled with a prefix indicating the building where the sample was collected. For example, all samples from Building 222 were labeled with the prefix "222". At Building 112, additional prefixes were used to designate the specific area at 112 where the sample was collected. For example, samples collected from the PCB dump area were labeled with the prefix "112PBC-DA".

Analytical Results

Confirmation sample results are summarized on tables 2-1, 3-1, 4-1, 5-1, 5-2, 5-3, 5-4, 5-5, 5-6, 5-7 and 5-8. A summary table was developed for each work area. Each summary table contains the following information: sample description, ULI ID number, sample date, parameter, matrix, method, units, project cleanup levels, NYS recommended cleanup level, sample result.

Each sample summary table lists the samples collected from each work area in chronological order. Each successive sample round includes samples taken after additional excavation was performed. Samples highlighted in gray indicate samples with results above the contract cleanup limits or NYSDEC TAGM 4046 Soil Guidance Values.

Review of the data indicates that all analyses were performed in accordance with method requirements and that the data are of good quality, with no corrective actions required.



SAMPLE LOCATION MAP
EXISTING SITE PLAN – BUILDING 20

SCALE: $\frac{1}{16}'' = 1'-0''$

Table 4-1 Summary of Analytical Results

Building 20 - Locomotive Roundhouse AOC

Confirmation Samples

Sample Description	ULI Lab ID No.	Sample Date	Parameter	Matrix	Method	Units	Project Cleanup Levels	State Recommended Cleanup level	Sample Results
Building 20 CE	22598145	08/13/98	Phenanthrene	Soil	8270	mg/kg	50	50	<0 38

Please note This sample was analyzed for full 8270, 8240 and PCBs Additional parameters can be found on the accompanying laboratory data sheets

1402 38

1402150

DATE: 08/27/98

state Laboratories, Inc.
lysis Results
port Number: 22598144
Client I.D.: OCUTO BLACKTOP & PAVING
Sampled by: Client

APPROVAL: ADS
QC: PD
Lab I.D.: 10170
INTERIM REMEDIAL
ACTION @ GAFB 20 CE 1342H 08/13/98 G

ULI I.D.: 22598145 Matrix: Soil

PARAMETERS	RESULTS	DATE ANAL.	KEY	FILE#
Percent Solids	87%	08/13/98		WC2812
TCL Volatiles by EPA Method 8240				
Chloromethane	<3ug/l	08/18/98		VM2025
Bromomethane	<3ug/l	08/18/98		VM2025
Vinyl Chloride	<2ug/l	08/18/98		VM2025
Chloroethane	<3ug/l	08/18/98		VM2025
Methylene Chloride	20ug/l	08/18/98		VM2025
Acetone	29ug/l	08/18/98		VM2025
Carbon Disulfide	<3ug/l	08/18/98		VM2025
1,1-Dichloroethene	<3ug/l	08/18/98		VM2025
1,1-Dichloroethane	<3ug/l	08/18/98		VM2025
trans-1,2-Dichloroethene	<3ug/l	08/18/98		VM2025
cis-1,2-Dichloroethene	<3ug/l	08/18/98		VM2025
Chloroform	<3ug/l	08/18/98		VM2025
1,2-Dichloroethane	<3ug/l	08/18/98		VM2025
2-Butanone	<10ug/l	08/18/98		VM2025
1,1,1-Trichloroethane	<3ug/l	08/18/98		VM2025
Carbon Tetrachloride	<3ug/l	08/18/98		VM2025
Bromodichloromethane	<3ug/l	08/18/98		VM2025
1,2-Dichloropropane	<3ug/l	08/18/98		VM2025
cis-1,3-Dichloropropene	<3ug/l	08/18/98		VM2025
Trichloroethene	<3ug/l	08/18/98		VM2025
Dibromochloromethane	<3ug/l	08/18/98		VM2025
1,1,2-Trichloroethane	<3ug/l	08/18/98		VM2025
Benzene	<3ug/l	08/18/98		VM2025
trans-1,3-Dichloropropene	<3ug/l	08/18/98		VM2025
Bromoform	<3ug/l	08/18/98		VM2025
4-Methyl-2-pentanone	<10ug/l	08/18/98		VM2025
2-Hexanone	<10ug/l	08/18/98		VM2025
Tetrachloroethene	<3ug/l	08/18/98		VM2025
1,1,2,2-Tetrachloroethane	<3ug/l	08/18/98		VM2025
Toluene	<3ug/l	08/18/98		VM2025
Chlorobenzene	<3ug/l	08/18/98		VM2025
Ethylbenzene	<3ug/l	08/18/98		VM2025
Styrene	<3ug/l	08/18/98		VM2025
m-Xylene and p-Xylene	<3ug/l	08/18/98		VM2025
o-Xylene	<3ug/l	08/18/98		VM2025
TCL Semivolatiles by EPA Method 8270				

dw = Dry weight

1402151

DATE: 08/27/98

state Laboratories, Inc. APPROVAL: QJS
alysis Results QC: JT
port Number: 22598144 Lab I.D.: 10170
Client I.D.: OCUTO BLACKTOP & PAVING INTERIM REMEDIAL
Sampled by: Client ACTION @ GAFB 20 CE 1342H 08/13/98 G

ULI I.D.: 22598145 Matrix: Soil

PARAMETERS	RESULTS	DATE ANAL.	KEY	FILE#
Phenol	<380ug/kg dw	08/17/98		SA1663
bis(2-Chloroethyl)ether	<380ug/kg dw	08/17/98		SA1663
2-Chlorophenol	<380ug/kg dw	08/17/98		SA1663
1,3-Dichlorobenzene	<380ug/kg dw	08/17/98		SA1663
1,4-Dichlorobenzene	<380ug/kg dw	08/17/98		SA1663
1,2-Dichlorobenzene	<380ug/kg dw	08/17/98		SA1663
2-Methylphenol	<380ug/kg dw	08/17/98		SA1663
2,2'-Oxybis(1-Chloropropane)	<380ug/kg dw	08/17/98		SA1663
4-Methylphenol	<380ug/kg dw	08/17/98		SA1663
n-Nitrosodi-n-propylamine	<380ug/kg dw	08/17/98		SA1663
Hexachloroethane	<380ug/kg dw	08/17/98		SA1663
Nitrobenzene	<380ug/kg dw	08/17/98		SA1663
Isophorone	<380ug/kg dw	08/17/98		SA1663
2-Nitrophenol	<380ug/kg dw	08/17/98		SA1663
2,4-Dimethylphenol	<380ug/kg dw	08/17/98		SA1663
bis(2-Chloroethoxy)methane	<380ug/kg dw	08/17/98		SA1663
2,4-Dichlorophenol	<380ug/kg dw	08/17/98		SA1663
1,2,4-Trichlorobenzene	<380ug/kg dw	08/17/98		SA1663
Naphthalene	<380ug/kg dw	08/17/98		SA1663
4-Chloroaniline	<380ug/kg dw	08/17/98		SA1663
Hexachlorobutadiene	<380ug/kg dw	08/17/98		SA1663
4-Chloro-3-methylphenol	<380ug/kg dw	08/17/98		SA1663
2-Methylnaphthalene	<380ug/kg dw	08/17/98		SA1663
Hexachlorocyclopentadiene	<380ug/kg dw	08/17/98		SA1663
2,4,6-Trichlorophenol	<380ug/kg dw	08/17/98		SA1663
2,4,5-Trichlorophenol	<380ug/kg dw	08/17/98		SA1663
2-Chloronaphthalene	<380ug/kg dw	08/17/98		SA1663
2-Nitroaniline	<1800ug/kg dw	08/17/98		SA1663
Dimethylphthalate	<380ug/kg dw	08/17/98		SA1663
Acenaphthylene	<380ug/kg dw	08/17/98		SA1663
2,6-Dinitrotoluene	<380ug/kg dw	08/17/98		SA1663
3-Nitroaniline	<1800ug/kg dw	08/17/98		SA1663
Acenaphthene	<380ug/kg dw	08/17/98		SA1663
2,4-Dinitrophenol	<1800ug/kg dw	08/17/98		SA1663
4-Nitrophenol	<1800ug/kg dw	08/17/98		SA1663
Dibenzofuran	<380ug/kg dw	08/17/98		SA1663
2,4-Dinitrotoluene	<380ug/kg dw	08/17/98		SA1663
Diethylphthalate	<380ug/kg dw	08/17/98		SA1663
4-Chlorophenylphenylether	<380ug/kg dw	08/17/98		SA1663
Fluorene	<380ug/kg dw	08/17/98		SA1663

dw = Dry weight

DATE: 08/27/98

state Laboratories, Inc.
alysis Results
eport Number: 22598144
Client I.D.: OCUTO BLACKTOP & PAVING
Sampled by: Client

APPROVAL: QJS
QC: [illegible]
Lab I.D.: 10170
INTERIM REMEDIAL
ACTION @ GAFB 20 CE 1342H 08/13/98 G

ULI I.D.: 22598145 Matrix: Soil

PARAMETERS	RESULTS	DATE ANAL.	KEY	FILE#
4-Nitroaniline	<1800ug/kg dw	08/17/98		SA1663
2-Methyl-4,6-dinitrophenol	<1800ug/kg dw	08/17/98		SA1663
n-Nitrosodiphenylamine	<380ug/kg dw	08/17/98		SA1663
4-Bromophenylphenylether	<380ug/kg dw	08/17/98		SA1663
Hexachlorobenzene	<380ug/kg dw	08/17/98		SA1663
Pentachlorophenol	<760ug/kg dw	08/17/98		SA1663
Phenanthrene	<380ug/kg dw	08/17/98		SA1663
Anthracene	<380ug/kg dw	08/17/98		SA1663
Carbazole	<380ug/kg dw	08/17/98		SA1663
di-n-butylphthalate	<380ug/kg dw	08/17/98		SA1663
Fluoranthene	<380ug/kg dw	08/17/98		SA1663
Pyrene	<380ug/kg dw	08/17/98		SA1663
Butylbenzylphthalate	<380ug/kg dw	08/17/98		SA1663
3,3'-Dichlorobenzidine	<380ug/kg dw	08/17/98		SA1663
Benzo(a)anthracene	<380ug/kg dw	08/17/98		SA1663
Chrysene	<380ug/kg dw	08/17/98		SA1663
bis(2-Ethylhexyl)phthalate	<380ug/kg dw	08/17/98		SA1663
di-n-octylphthalate	<380ug/kg dw	08/17/98		SA1663
Benzo(b)fluoranthene	<380ug/kg dw	08/17/98		SA1663
Benzo(k)fluoranthene	<380ug/kg dw	08/17/98		SA1663
Benzo(a)pyrene	<380ug/kg dw	08/17/98		SA1663
Indeno(1,2,3-cd)pyrene	<380ug/kg dw	08/17/98		SA1663
Dibenzo(a,h)anthracene	<380ug/kg dw	08/17/98		SA1663
Benzo(ghi)perylene	<380ug/kg dw	08/17/98		SA1663
PCB (Aroclors) by EPA Method 8080				
Aroclor 1016	<0.1mg/kg dw	08/19/98		PA4445
Aroclor 1221	<0.1mg/kg dw	08/19/98		PA4445
Aroclor 1232	<0.1mg/kg dw	08/19/98		PA4445
Aroclor 1242	<0.1mg/kg dw	08/19/98		PA4445
Aroclor 1248	<0.1mg/kg dw	08/19/98		PA4445
Aroclor 1254	<0.1mg/kg dw	08/19/98		PA4445
Aroclor 1260	<0.1mg/kg dw	08/19/98		PA4445
Total PCB	<0.1mg/kg dw	08/19/98		PA4445

dw = Dry weight

Appendix C
(Building 20 AOC Record of Decision)

Final Record of Decision for the Building 20 Area of Concern (SS-23) at the Former Griffiss Air Force Base Rome, New York

June 2001

AIR FORCE BASE CONVERSION AGENCY

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List of Abbreviations and Acronyms

AFB	Air Force Base
AFBCA	Air Force Base Conversion Agency
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
BGS	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	chemicals of potential concern
DFAS	Defense Finance and Accounting Services
DoD	Department of Defense
EPA	United States Environmental Protection Agency
FFA	Federal Facility Agreement
HI	Hazard Index
HQ	Hazard Quotient
IRP	Installation Restoration Program
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEADS	Northeast Air Defense Sector
NPL	National Priorities List
NYANG	New York Air National Guard
NYSDEC	New York State Department of Environmental Conservation
PCB	polychlorinated biphenyl
ppm	parts per million
RAB	Restoration Advisory Board
RI	remedial investigation
ROD	Record of Decision
SAC	Strategic Air Command
SARA	Superfund Amendment and Reauthorization Act
SVOC	semivolatile organic compound
TAGM	Technical and Administrative Guidance Memorandum
TBC	To-Be-Considered
VOC	volatile organic compound

1 Declaration

1.1 Site Name and Location

The Building 20 Area of Concern (AOC) (site identification designation SS-23) is located at the former Griffiss Air Force Base (AFB) in Rome, Oneida County, New York.

1.2 Statement of Basis and Purpose

This Record of Decision (ROD) presents the institutional controls alternative, in the form of land use and groundwater restrictions, as the selected remedial action for Building 20 AOC at the former Griffiss AFB. This alternative has been chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (USEPA 1980), as amended by the Superfund Amendment and Reauthorization Act (SARA) (USEPA 1986) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (USEPA 1968). The Air Force Base Conversion Agency (AFBCA), the United States Environmental Protection Agency (EPA), and the New York State Department of Environmental Conservation (NYSDEC) have adopted this ROD through joint agreement. The decision is based on the administrative record file for this site.

1.3 Description of Selected Remedy

The selected remedy for the Building 20 AOC is institutional controls in the form of land use restrictions for industrial/commercial use and groundwater use restrictions. The agencies will perform joint 5-year reviews to ensure that future land use and restricted groundwater use are in compliance with the transfer documents (deed) and consistent with the risk assessment for industrial/commercial use with groundwater use restrictions.

1.4 Declaration Statement

The AFBCA, EPA, and NYSDEC have determined that institutional controls in the form of land use restrictions, which include groundwater use restrictions, are warranted for the Building 20 AOC. An interim remedial action was performed at this site in which the majority of soil contamination found during the remedial investigation was removed. The remaining chemicals detected in the soil do not exceed standards and guidance values and the known source of groundwater contamination has been removed. Although the baseline risk assessment indicated a slight noncarcinogenic risk to the industrial worker from ingestion of groundwater, the transfer documents (deed) for industrial/commercial use will restrict the use of site groundwater. The concentrations of the contaminants remaining in the site soil following the remedial action do not pose a current or potential threat to public health or the environment provided the property is used for industrial/commercial use. Future landowners will be bound, through transfer documents, to the industrial/commercial reuse of the property.

1.5 Signature of Adoption of the Remedy

On the basis of the remedial investigations and a successfully completed Interim Remedial Action performed at the Building 20 AOC, there is no evidence that residual contamination at this site poses a current or future potential threat to human health or the environment when used for industrial/commercial purposes with groundwater use restrictions. Future landowners will be bound, through transfer documents (deed), to the industrial/commercial reuse of the property. The New York State Department of Environmental Conservation has concurred with the selected remedial action presented in this ROD.

August 20, 2001

Albert F. Lowas, Jr.
Director
Air Force Base Conversion Agency

Date

9/27/01

William J. Muszynski, P.E.
Acting Regional Administrator
United States Environmental Protection Agency, Region 2

Date

2 Decision Summary

2.1 Site Name, Location, and Brief Description

The Building 20 Area of Concern (AOC) (site identification designation SS-23) is located at the former Griffiss Air Force Base (AFB) in Rome, Oneida County, New York.

Building 20 is located in the south-central portion of the base along the southern margin of the industrial complex (see Figure 1). It is bounded by Perimeter Road to the west and Ellsworth Road to the south (see Figure 2). Building 20 is the locomotive roundhouse, which was used to store and service diesel locomotives at the former base. Operations at Building 20 began in 1943. During operations, lubricants and diesel locomotive parts were used and stored in the roundhouse. PCB-containing hydraulic fluids were used in the locomotives.

2.2 Site History and Investigation Activities

The Former Griffiss AFB Operational History

The mission of the former Griffiss AFB varied over the years. The base was activated on February 1, 1942, as Rome Air Depot, with the mission of storage, maintenance, and shipment of material for the U.S. Army Air Corps. Upon creation of the U.S. Air Force in 1947, the depot was renamed Griffiss Air Force Base. The base became an electronics center in 1950, with the transfer of Watson Laboratory Complex (later Rome Laboratory). The 49th Fighter Interceptor Squadron was also added in that year. In June 1951, the Rome Air Development Center was established with the mission of accomplishing applied research, development, and testing of electronic air-ground systems. The Headquarters of the Ground Electronics Engineering Installations Agency was added in June 1958 to engineer and install ground communications equipment throughout the world. On July 1, 1970, the 416th Bombardment Wing of the Strategic Air Command (SAC) was activated with the mission of maintenance and implementation of both effective air refueling operations and long-range bombardment capability. Griffiss AFB was designated for realignment under the Base Realignment and Closure Act in 1993 resulting in deactivation of the 416th Bombardment Wing in September 1995. Rome Laboratory and the Northeast Air Defense Sector (NEADS) will continue to operate at their current locations; the New York Air National Guard (NYANG) operated the runway for the 10th Mountain Division deployments until October 1998 when they were relocated to Fort Drum; and the Defense Finance and Accounting Services (DFAS) has established an operating location at the former Griffiss AFB.

Environmental Background

As a result of the various national defense missions carried out at the former Griffiss AFB since 1942, hazardous and toxic substances were used and hazardous wastes were generated, stored, or disposed at various sites on the installation. The defense missions involved, among others, procurement, storage, maintenance, and shipping of war materiel; research and development; and aircraft operations and maintenance.

Numerous studies and investigations under the U.S. Department of Defense (DoD) Installation Restoration Program (IRP) have been carried out to locate, assess, and quantify the past toxic and hazardous waste storage, disposal, and spill sites. These investigations included a records search in 1981 (Engineering Science 1981), interviews with base personnel, a field inspection, compilation of an inventory of wastes, evaluation of disposal practices, and an assessment to determine the nature and extent of site contamination; Problem Confirmation and Quantification studies (similar to what is now designated a Site Investigation) in 1982 (Weston 1982) and 1985 (Weston 1985); soil and groundwater analyses in 1986; a base-wide health assessment in 1988 by the U.S. Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR) (ATSDR 1988); base-specific hydrology investigations in 1989 and 1990 (Geotech 1991); a groundwater investigation in 1991; and site-specific investigations between 1989 and

1993. ATSDR issued a Public Health Assessment for Griffiss AFB, dated October 23, 1995 (ATSDR 1995), and an addendum, dated September 9, 1996.

Pursuant to Section 105 of CERCLA, Griffiss AFB was included on the National Priorities List (NPL) on July 15, 1987. On August 21, 1990, the agencies entered into a Federal Facility Agreement under Section 120 of CERCLA. Under the terms of the agreement, the Air Force was required to prepare and submit numerous reports to NYSDEC and EPA for review and comment. These reports address remedial activities that the Air Force is required to undertake under CERCLA and include identification of AOCs on base; a scope of work for a remedial investigation (RI); a work plan for the RI, including a sampling and analysis plan and a quality assurance project plan; a baseline risk assessment; a community relations plan; and an RI report. The Air Force delivered the draft-final RI report covering 31 AOCs to EPA and NYSDEC on December 20, 1996 (Law 1996). The draft Closure Certification Report for Interim Remedial Action was delivered on May 24, 2000 (Ocuto 2000).

This ROD for institutional controls is based on an evaluation of potential threats to human health and the environment due to contamination in the soil and groundwater and the performance of interim remedial actions at the Building 20 AOC. During the RI, a site-specific baseline risk assessment (using appropriate toxicological and exposure assumptions to evaluate cancer risks and non-cancer health hazards) was conducted in order to evaluate the risks posed by detected site contaminants to the reasonably maximally exposed individual under current and future land use assumptions. The risk assessment for this site evaluated an industrial use scenario. In the RI report, the concentrations of the contaminants were compared to available standards and guidance values using federal and state environmental and public health laws that were identified as potentially applicable or relevant and appropriate requirements at the site. Chemical-specific ARARs are usually health- or risk-based numerical values or methodologies that result in a numerical value when applied to site-specific conditions. Currently, there are no chemical-specific ARARs for soil (other than for PCBs), therefore, other non-promulgated federal and state advisories and guidance values, referred to as To-Be-Considereds (TBCs), and background levels of the contaminants in the absence of TBCs, were considered.

Initial Site Investigations

In 1985, soil was removed as part of steam tunnel entrance work at the northwest corner of Building 20. The construction contractor encountered a concrete conduit that housed a previously abandoned steam line. Upon penetration of the foundation, approximately 150 to 200 gallons of a free flowing oily liquid entered the excavation. It was determined that a floor drain system within the building (connected to the sanitary sewer system) had developed a break which allowed waste fluids to leak into a cavity beneath the floor.

All recoverable liquid, contaminated soil, concrete, and debris encountered were containerized into 55-gallon drums (16 drums of liquids and 141 drums of solids). Subsequent analysis of the excavated material reported 109 parts per million (ppm) PCBs, 700 ppm lead, and 446,000 ppm oil and grease. This material was properly disposed of by the Air Force in 1987.

In 1986, subsurface investigations at the northwest corner of Building 20 were performed (HET 1986). Five soil borings were advanced through the concrete floor inside the building, soil samples were collected at 2-foot intervals to groundwater (encountered at 8 feet BGS), and one grab groundwater sample was collected from each soil boring. One monitoring well B20MW-1 was also installed. The sampling results revealed residual hydrocarbon contamination in all borings and residual metals near the surface in the northwest and southwest corners of the building.

In 1992, as part of the 1992/1993 quarterly sampling program, B20MW-1 was sampled for four consecutive quarters. Three volatile organic compounds, one semivolatile organic compound, and ten metals were detected. Glycols were detected in two of the four quarters of sampling.

Remedial Investigation

In 1994, an RI was performed (Law 1996). The main objective of the RI was to investigate the nature and extent of environmental contamination from historical releases at the AOC in order to determine whether any further remedial action was necessary to prevent potential threats to human health and the environment that might arise from exposure to site conditions. The RI included the drilling of six soil borings; the collection of 19 soil samples for on-site field screening analysis (four of which were confirmed off-site); the collection of one grab groundwater sample from one of the soil borings; and the installation and sampling of two groundwater wells (B20MW-2 and B20MW-3) and sampling of the one existing well (B20MW-1).

Soil Investigation. Analysis of the soil samples collected during the RI field screening indicated the presence of two SVOCs, and eight metals. Three metals were detected at concentrations above the potential TBCs and background screening levels. Off-site analysis of the confirmatory soil samples analyzed off site revealed the presence of five VOCs, 18 SVOCs, five pesticides, one PCB, 23 metals and petroleum hydrocarbons. The concentrations of five SVOCs and four metals exceeded potential TBCs or background screening concentrations for soil (see Table 1).

Groundwater Investigation. No analytes were detected in the field screening of the one grab groundwater sample collected for the RI. Analysis of the groundwater samples from monitoring wells indicated the presence of four VOCs, 17 SVOCs, eight pesticides, 21 metals, and petroleum hydrocarbons. The concentrations of six SVOCs, one pesticide, seven metals, and petroleum hydrocarbons exceeded the most stringent criterion for groundwater (see Table 2).

2.3 Highlights of Community Participation

The final proposed plan for the Building 20 AOC (AFBCA 2001), indicating institutional controls in the form of land use restrictions for industrial/commercial use with groundwater use restrictions, was released to the public on Friday, February 9, 2001. The document was made available to the public in both the administrative record file located at Building 301 in the Griffiss Business and Technology Park and in the Information Repository maintained at the Jervis Public Library. The notice announcing the availability of this document was published in the *Rome Sentinel* on February 9, 2001. A public comment period lasting from February 9, 2001, to March 11, 2001, was set up to encourage public participation in the remedial action selection process. In addition, a public meeting was held on March 1, 2001. The AFBCA and the Department of Health were present at the meeting and the AFBCA answered questions about issues at the AOC and the institutional controls proposal under consideration. A response to the comments received during this period is included in the Responsiveness Summary, which is part of this ROD (see Section 3).

2.4 Scope and Role of Site Response Action

The scope of the institutional controls in the form of land use restrictions and groundwater use restrictions for the Building 20 AOC addresses the soil and groundwater at the site. The land use restrictions for industrial/commercial use are consistent with the risk assessment performed for occupational workers.

2.5 Site Characteristics

Building 20 is located in the south-central portion of the base along the southern margin of the industrial complex (see Figure 1). It is bounded by Perimeter Road to the west and Ellsworth Road to the south (see Figure 2). Building 20 is the locomotive roundhouse, which was used to store and service diesel locomotives at the former base. Operations at Building 20 began in 1943. During operations, lubricants and diesel locomotive parts were used and stored in the roundhouse. PCB-containing hydraulic fluids were used in the locomotives.

In the northwest corner of Building 20, a sump collects runoff from floor drains located in Building 20. Liquid collected in the sump is pumped to the sanitary sewer, which ultimately discharges to the Rome publicly owned treatment works. A concrete conduit for steam lines is connected to the sump. The conduit runs north from the sump to the north wall of Building 20 where steam service enters the building. Sometime in the past, the steam service was rerouted overhead and the concrete conduit was abandoned. It is not known whether the conduit was subsequently plugged.

The former Griffiss AFB covered approximately 3,552 contiguous acres in the lowlands of the Mohawk River Valley in Rome, Oneida County, New York. Topography within the valley is relatively flat, with elevations on the former Griffiss AFB ranging from 435 to 595 feet above mean sea level. Three Mile Creek, Six Mile Creek (both of which drain into the New York State Barge Canal, located to the south of the base), and several state-designated wetlands are located on the former Griffiss AFB, which is bordered by the Mohawk River on the west. Due to its high average precipitation and predominantly silty sands, the former Griffiss AFB is considered a groundwater recharge zone.

Building 20 is located on an area of the base that is topographically level, with about 3 feet of relief occurring in the surrounding area. The area around Building 20 is grassy to the south and predominantly paved to the north. The building is not located near any major surface water drainage features. Surface water runoff from the site is collected by the former base's storm drainage system. Storm drains run south to north on both the east and west sides of Building 20, carrying runoff to Six Mile Creek, which ultimately drains to the New York State Barge Canal. Building 20 AOC is located on a groundwater divide; groundwater on the west side of the AOC flows to the west toward Three Mile Creek and on the east side groundwater flows east to Rainbow Creek.

The upper 2 feet of soil consists of fine-to-medium sand with silt and/or gravel. Subsurface soil and soil below the concrete inside the building and below the asphalt outside the building consisted primarily of fine-to-medium sand with variable silt and gravel ranging from 2 to 20 feet below ground surface (BGS).

2.6 Current and Potential Future Site Use

The current land use designation for the Building 20 AOC is industrial. In accordance with the Griffiss Redevelopment Planning Council redevelopment scenario, the future land use designation is industrial/commercial.

2.7 Summary of Site Risks

Site risks were analyzed based on the extent of contamination at the Building 20 AOC. As part of the RI, a baseline risk assessment was conducted to evaluate current and future potential risks to human health and the environment associated with contaminants found in the soil and groundwater at the site. The results of this assessment and the interim remedial action were considered when formulating this ROD for institutional controls.

Human Health Risk Assessment

A baseline human health risk assessment was conducted during the RI to determine whether chemicals detected at the Building 20 AOC could pose health risks to individuals under current and proposed future land use. As part of the baseline risk assessment, the following four-step process was used to assess site-related human health risks for a reasonable maximum exposure scenario:

- Hazard Identification—identifies the contaminants of concern at the site based on several factors such as toxicity, frequency of occurrence, and concentration;
- Exposure Assessment—estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathway (e.g., ingestion of contaminated soil) by which humans are potentially exposed;
- Toxicity Assessment—determines the types of adverse health effects associated with chemical exposures and the relationship between magnitude of exposure (dose) and severity of adverse effects (response); and
- Risk Characterization—summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative (e.g., one-in-a-million excess cancer risk and non-cancer Hazard Index value) assessment of site-related risks and a discussion of uncertainties associated with the evaluation of the risks and hazards for the site.

Chemicals of potential concern (COPCs) were selected for use in the risk assessment based on the analytical results and data quality evaluation. All contaminants detected in the soil and groundwater at the site were considered chemicals of potential concern with the exception of inorganics detected at concentrations less than twice the mean background concentrations; iron, magnesium, calcium, potassium, and sodium, which are essential human nutrients; and compounds detected in less than 5% of the total samples (unless they were known human carcinogens). As a class, petroleum hydrocarbons were not included as a chemical of concern; however, the individual toxic constituents (e.g., benzene, toluene, ethylbenzene) were evaluated.

The human health risk assessment evaluated potential exposure of utility and construction workers to chemicals detected in the soil and industrial workers to chemicals detected in groundwater. The various exposure scenarios for each population are described in Table 3. Intake assumptions, which are based on EPA guidance, are more fully described in the RI.

Quantitative estimates of carcinogenic and noncarcinogenic risks were calculated for the Building 20 AOC as part of a risk characterization. The risk characterization evaluates potential health risks based on estimated exposure intakes and toxicity values. For carcinogens, risks are estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the potential carcinogen. The risks of the individual chemicals are summed for each pathway to develop a total risk estimate. The range of acceptable risk is generally considered to be 1 in 10,000 (1×10^{-4}) to 1 in 1,000,000 (1×10^{-6}) of an individual developing cancer over a 70-year lifetime from exposure to the contaminant(s) under specific exposure assumptions. Therefore, sites with carcinogenic risk below the risk range for a reasonable maximum exposure do not generally require cleanup based upon carcinogenic risk under the NCP.

To assess the overall noncarcinogenic effects posed by more than one contaminant, EPA has developed the Hazard Quotient (HQ) and Hazard Index (HI). The HQ is the ratio of the chronic daily intake of a chemical to the reference dose for the chemical. The reference dose is an estimate (with uncertainty spanning perhaps an order of magnitude or greater) of a daily exposure level for the human population, including sensitive sub-populations, that is likely to be without an appreciable risk of deleterious effects during a portion of a lifetime. The HQs are summed for all contaminants within an exposure pathway (e.g., ingestion of soil) and across pathways to determine the HI. When the HI exceeds 1, there may be concern for potential noncarcinogenic health effects if the contaminants in question are believed to cause similar toxic effects.

EPA bases its decision to conduct site remediation on the risk to human health and the environment. Cleanup actions may be taken when EPA determines that the risk at a site exceeds the cancer risk level of 1 in 10,000 (1×10^{-4}) or if the noncarcinogenic HI exceeds a level of 1. Once either of these thresholds has been exceeded, the 1 in 1,000,000 (1×10^{-6}) risk level and an HI of 1 or less may be used as the point of departure for determining remediation goals for alternatives.

Results of Site-Specific Health Risk Assessment

Potential risks from exposure to COPCs at the Building 20 AOC were evaluated for utility, construction, and industrial workers during the RI, prior to the interim remedial action. The potential carcinogenic and noncarcinogenic risks from exposure to soil and groundwater are summarized below.

Carcinogenic Risks

The total carcinogenic risk associated with exposure of utility workers to subsurface soil was 1×10^{-6}, which is at the low end of the EPA's target risk range. The pathway-specific risks for utility workers from ingestion of soil, inhalation of fugitive dust, and dermal contact were 1×10^{-6}, 3×10^{-10}, and 5×10^{-9}, respectively. The total carcinogenic risk associated with exposure of construction workers to subsurface soil was 2×10^{-6}, which is within the EPA's target risk range. The pathway-specific risks for construction workers from incidental ingestion of soil, inhalation of fugitive dust, and dermal contact were 2×10^{-6}, 8×10^{-11}, and 1×10^{-9}, respectively. The total carcinogenic risk associated with exposure of industrial workers to contaminants in groundwater was 1×10^{-4}, which is equal to the upper end of the EPA's target risk range. The pathway-specific risks for industrial workers from incidental ingestion of groundwater, inhalation of VOCs released from groundwater, and dermal contact with groundwater were 5×10^{-5}, 4×10^{-9}, and 6×10^{-5}, respectively. The risks from ingestion of groundwater contaminated with arsenic and dermal contact with groundwater contaminated with benzo(a)pyrene were the greatest contributors to the risk. Although arsenic did not exceed standards, it was included in the risk assessment and did contribute to the potential risk at this site.

Noncarcinogenic Risk

The total HI for potential utility workers exposed to subsurface soil was 0.001. This total HI is below the acceptable level of 1.

The total HI calculated for potential construction workers exposed to subsurface soil was 0.05. This total HI is below the acceptable level of 1.

The total HI for potential industrial workers exposed to groundwater was 2. This HI is above the acceptable level of 1. The calculated hazard indices for industrial workers from incidental ingestion of groundwater, inhalation of VOCs released from groundwater, and dermal contact with groundwater were 2.0, 2×10^{-6}, and 0.01 respectively. The exposure pathway presenting the greatest potential noncarcinogenic hazard was from the incidental ingestion of groundwater contaminated with thallium, manganese, antimony, and arsenic. Although arsenic did not exceed standards, it was included in the risk assessment and did contribute to the potential risk at this site.

Toxicity values were not available for 2-methylnaphthalene, acenaphthylene, benzo(g,h,i)peryline, phenanthrene, coumaphos, and chloroneb and, therefore, the risk arising from exposure to these compounds was assessed qualitatively. Possible exposures to the site concentrations of these compounds are unlikely to pose a health hazard for occupational receptors potentially performing intrusive activities at this site.

The results of the human health baseline risk assessment indicate that chemicals in soil should not present a risk to current and future utility, construction, and industrial workers. The only potentially unacceptable risk was to industrial receptors from ingestion of groundwater (HI equal to 2), which is an unlikely scenario. Quantitative evaluation of risk is subject to several conservative assumptions and should not be considered an absolute measure of risk.

Uncertainties

Uncertainties exist in many areas of the human health risk assessment process. However, use of conservative variables in intake calculations and health-protective assumptions throughout the entire risk assessment process results in an assessment that is protective of human health and the environment. Examples of uncertainties associated with the risk assessment for this AOC include (1) Chemical samples were collected from the suspected source of contamination rather than through random sampling, which may result in a potential overestimation of risk; (2) The HIs associated with dermal contact with soil were not quantified for the majority of COPCs, which may lead to underestimation of the overall risk due to dermal contact; (3) The models used in the RI are likely to overestimate exposure point concentrations in air, which would cause a potential overestimation of risk for the inhalation pathway; (4) Toxicological criteria were not available for all chemicals found at the site, which may result in a potential underestimation of risk; (5) Construction at the site was assumed to occur over a one year period. Since construction may take less time to complete, this would result in a potential overestimation of risk; (6) It was assumed that groundwater would be used as a potable water source under the industrial use scenario (i.e., showering, ingestion, industrial processes) in the future, which is unlikely since the site has ready access to the existing water supplies at the former base and in the City of Rome. This assumption would result in a potential overestimation of risk.

Ecological Risk Assessment

A baseline risk assessment for ecological receptors at the Building 20 AOC was conducted during the RI. Since Building 20 is located in a highly developed portion of the base, no complete exposure pathways for ecological receptors were identified. Contamination that may be associated with the site is expected to be well below ground surface and ecological receptors are not expected to be found at these depths. In addition, the future land use designation is expected to remain industrial. Therefore, potential exposures related to this AOC are not expected to exist.

Although certain state-listed endangered plants and animals have been on or in the vicinity of the base, no threatened and/or endangered species have been identified at this site (Corey 1994). There are no federally listed (U.S. Department of the Interior) threatened or endangered plant or animal species at the former base.

2.8 Interim Remedial Action

In 1998, based upon the results of the RI and baseline risk assessment, an interim remedial action was performed to remove contaminated soil beneath the floor near the northwest corner of the building (see Figure 3) (Ocuto 2000). It was determined that the removal of contaminated soil from this location would mitigate the majority of contamination and resulting risk associated with this site. The work consisted primarily of saw cutting and removal of concrete, soil excavation, confirmation sampling, transportation and off-site disposal of excavated materials, grouting of abandoned pipelines, plugging and capping of existing floor drains and sumps, backfilling, and concrete restoration. A brief summary of this remedial action is provided below.

Remedial action work activities began on August 12, 1998. Equipment was mobilized, work zones were established, and the floor was saw cut in the area of the large excavation in the northwest corner of the building. The concrete was removed and stockpiled on a bermed liner. On the following day, the concrete floor was saw cut around the floor drains and the concrete removed. All pipes leading to the northwest and south bay sumps were removed, plugged, and grouted and the sumps were plugged and capped. Contaminated soil was excavated from the northwest corner and added to the concrete stockpile on the bermed liner. The estimated volume of soil removed from the excavation was 2.1 cubic yards.

Confirmatory samples were taken after the removal action was completed to verify the effectiveness of this interim remedial action. The Air Force, EPA, and NYSDEC compared the results of the confirmatory soil samples to the risk-based cleanup goals and NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4046: Determination of Soil Cleanup Objectives and Soil Cleanup Levels (NYSDEC 1994). After agreement was reached that the project goals were met, the excavated area was backfilled with clean material and the concrete floor slab replaced.

On October 16, 1998, the stockpiled material was loaded for transport to Seneca Meadows for disposal.

2.9 Principal Threat Wastes

There are no principal threat wastes at the Building 20 AOC.

2.10 Description of the Preferred Alternative

Institutional controls in the form of land use restrictions for industrial/commercial use and groundwater use restrictions is proposed for the Building 20 AOC. Five-year reviews will be performed by the Air Force, in conjunction with the EPA and NYSDEC, to ensure that future land use is in compliance with the transfer documents (deed) for industrial/commercial use. The transfer documents will contain the following restrictions to ensure that the reuse of the site is consistent with the risk assessment:

- The property will be designated for industrial/commercial use unless permission is obtained from the EPA, NYSDEC, and the New York State Department of Health; and

- The owner or occupant of the property shall not extract, utilize, consume, or permit to be extracted any water from the subsurface aquifer within the boundary of the property unless such owner or occupant obtains prior written approval from the New York State Department of Health.

As a result of the interim remedial action, the majority of soil contamination found during the RI investigations at this AOC was removed and the remaining chemicals detected in the soil do not exceed standards and guidance values and the known source of the groundwater contamination has been removed. In addition, the baseline risk assessment for industrial/commercial use indicated that the levels of contamination present in the soil and groundwater prior to remediation fell within or below EPA's acceptable carcinogenic risk range and posed no noncarcinogenic risk to utility and construction workers, and just a slight noncarcinogenic risk to the industrial worker from ingestion of groundwater, which is a very unlikely pathway. Therefore, the concentrations of the chemicals remaining in the soil after the completion of the remedial action and the results of the baseline risk assessment for the chemicals found in the groundwater demonstrate that the remaining site contaminants, in conjunction with the institutional controls mentioned earlier, pose no current or potential threat to public health or the environment.

2.11 Statutory Determinations

The selected remedy must meet the statutory requirements of CERCLA, Section 121, which are itemized in Section 1.5 of this ROD and described below.

Protection of Human Health and the Environment

The plan for institutional controls in the form of land use restrictions for industrial/commercial use with groundwater use restrictions will provide adequate protection from exposure to contaminants by limiting the use of the site in accordance with the risk assessment.

Compliance with ARARs

Contaminant concentrations in the soil following the interim remedial action comply with the applicable ARARs. Furthermore, land use restrictions for industrial/commercial use will be consistent with the risk assessment, which was performed for occupational workers.

Cost-Effectiveness

No costs are associated with the selected alternative.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

Treatment technologies are not included in the selected alternative.

Preference for Treatment as a Principal Element

Treatment technologies are not included in the selected alternative.

2.12 Documentation of Significant Changes

No significant changes have been made to the selected remedy from the time the proposed plan was released for public comment.

Table 1
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
BUILDING 20 AOC
GROUNDWATER SAMPLES

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
SVOCs (µg/L)			
Benzo(a)anthracene	0.2 J - 0.3 J	2/4	0.002 [a]
Benzo(a)pyrene	0.2 J	2/4	ND
Benzo(b)fluoranthene	0.2 J - 0.4 J	2/4	0.002 [b]
Benzo(k)fluoranthene	0.08 J - 0.09 J	2/4	0.002 [b]
Chrysene	0.3 J - 0.4 J	2/4	0.002 [b]
Indeno(1,2,3-cd)pyrene	0.04 J - 0.09 J	2/4	0.002 [b]
Pesticides/PCBs (µg/L)			
Dieldrin	0.005 J	1/4	0.004 [a]
Metals (mg/L)			
Aluminum	0.66 - 1.02	2/3	0.05 [c]
Antimony	0.0142 J	1/3	0.003 [a]
Chromium	0.0142 J - 0.114 J	1/3	0.05 [a]
Iron	0.088 J - 2.65	2/3	0.3 [a]
Manganese	0.088 - 0.816	3/3	0.05 [c]
Sodium	36.8 - 384	3/3	20 [a]
Thallium	0.00045 J - 0.005 J	1/3	0.0005 [b]
Wet Chemistry (mg/L)			
Petroleum Hydrocarbons	0.09 J - 0.13 J	3/3	0.1 [a]

[a] NYSDEC Class GA groundwater standard; June 1998

[b] NYSDEC Class GA groundwater guidance values; June 1998

[c] Federal secondary maximum contaminant level

Key:
J = Estimated concentration*
ND = Nondetect
U = Analyte not detected

* Estimated concentrations are typically due to measuring very low levels below the quantitation limit but above the detection limit or due to a quality control concem identified by a data reviewer.

Table 2
COMPOUNDS EXCEEDING GUIDANCE VALUES
BUILDING 20 AOC
SOIL SAMPLES

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
SVOCs (µg/kg)			
Benzo(a)anthracene	31,000 J	1/4	224 [a]
Chrysene	38,000 J	1/4	400 [a]
Fluoranthene	130 J - 55,000	1/4	50,000 [a]
Phenanthrene	130 J - 75,000	1/4	50,000 [a]
Pyrene	100 J - 73,000 J	1/4	50,000 [a]
Metals (mg/kg)			
Calcium	1,950 - 74,800	2/4	23,821 [b]
Chromium	9.8 - 27.7 J	1/4	22.6 [b]
Silver	0.61 J - 6.4 J	1/4	1.1 U [b]
Sodium	196 - 598	1/4	259 [b]

[a] NYS-recommended soil cleanup objective

[b] Background screening concentration

Key:
J = Estimated concentration*
U = Analyte not detected

* Estimated concentrations are typically due to measuring very low levels below the quantitation limit but above the detection limit or due to a quality control concem identified by a data reviewer.

Table 3
BUILDING 20 AOC
RISK ASSESSMENT
EXPOSURE SCENARIOS

UTILITY AND CONSTRUCTION WORKERS	INDUSTRIAL WORKER
• Incidental ingestion of soils • Inhalation of fugitive dust • Dermal contact with soils	• Ingestion of groundwater • Dermal contact with groundwater • Inhalation of VOCs from groundwater

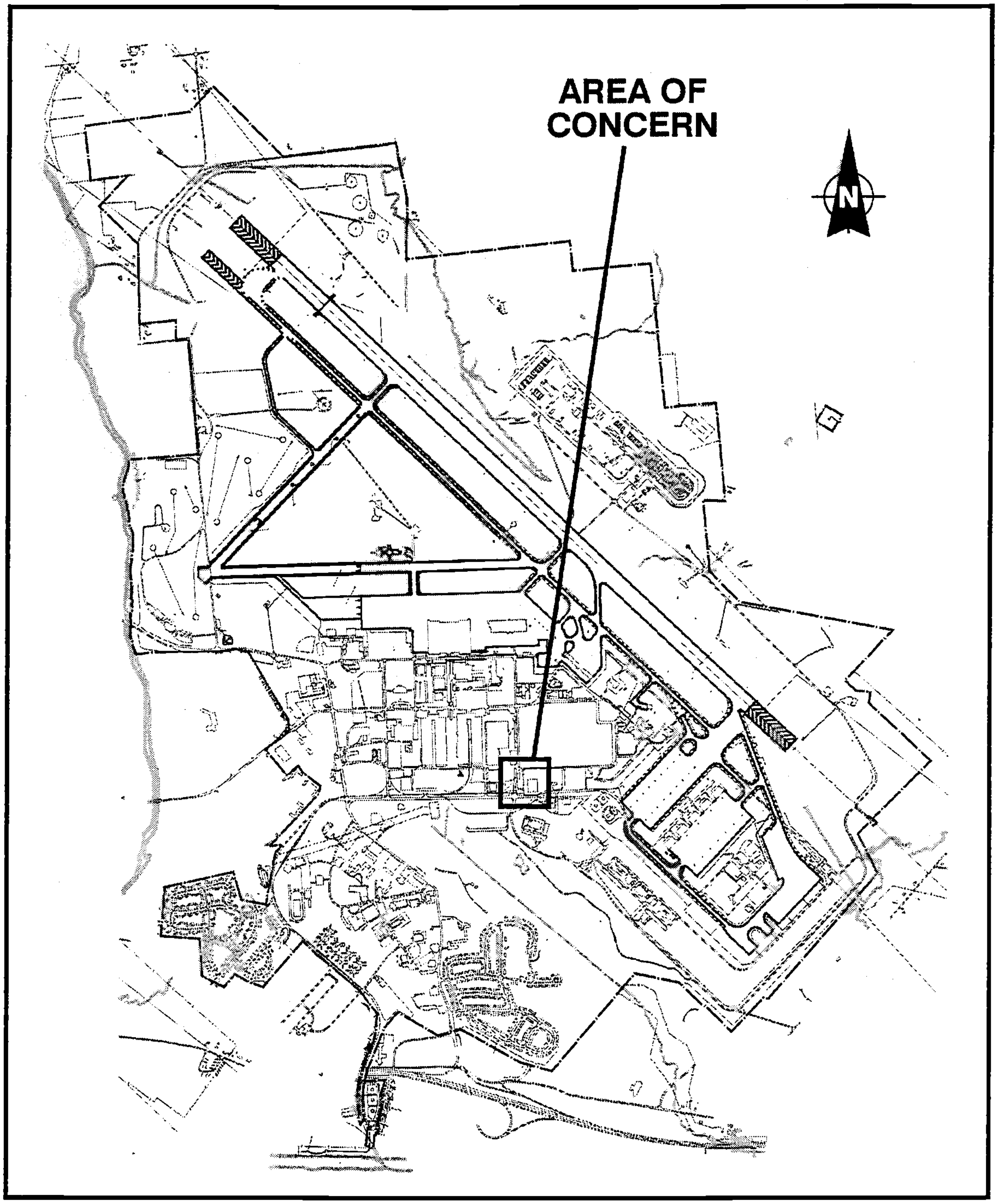

Figure 1 Building 20 AOC Location Map

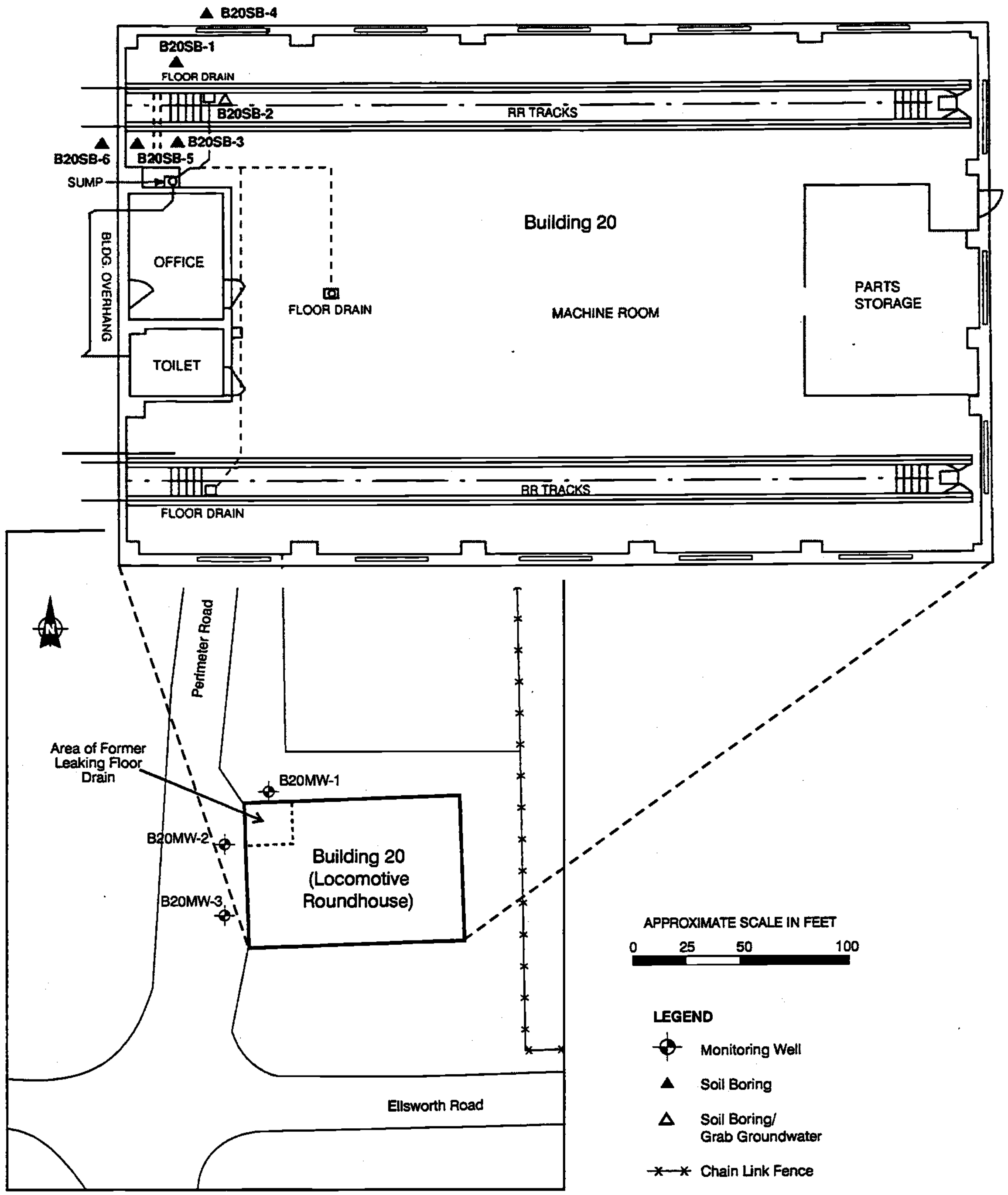

Figure 2 Building 20 AOC Site Map

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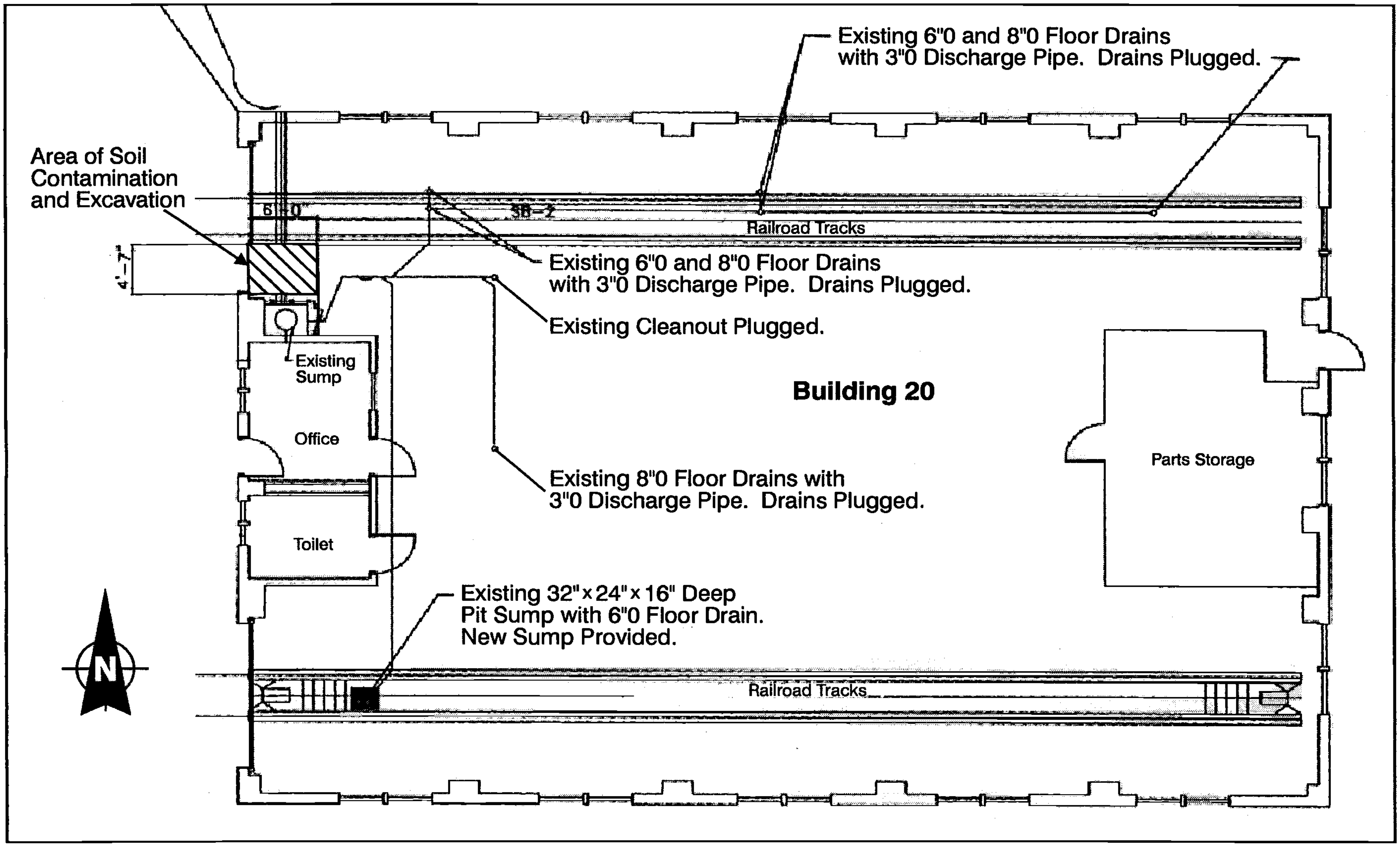

Figure 3 Building 20 AOC Interim Remedial Action

3 Responsiveness Summary

On Friday, February 9, 2001, AFBCA, following consultation with and concurrence of the EPA and NYSDEC, released for public comment the proposed plan for institutional controls at the Building 20 AOC at the former Griffiss Air Force Base. The release of the proposed plan initiated the public comment period, which concluded on March 11, 2001.

During the public comment period, a public meeting was held on Thursday, March 1, 2001, at 5:00 p.m. at the Floyd Town Hall located at 8299 Old Floyd Road, Rome, NY. A court reporter recorded the proceedings of the public meeting. A copy of the transcript and attendance list are included in the Administrative Record. The public comment period and the public meeting were intended to elicit public comment on the proposal for remedial action at the site.

This document summarizes and provides responses to the verbal comments received at the public meeting and the written comments received during the public comment period.

Comment #1 (oral - Carmen Malagisi)

Mr. Malagisi requested an explanation of the five-year review process and whether there was a termination criteria for the five-year review.

Response #1

The five-year review is conducted by the Air Force, in conjunction with the EPA and NYSDEC, to assure that human health and the environment are being protected by the remedial actions being implemented. In this case, the review will ensure that the land use is in compliance with industrial/commercial use, institutional controls such as deed restrictions remain in place, and that the cleanup standards used in the ROD are still appropriate. During the first five-year review, and any subsequent review, if it is determined that conditions at a portion of the site have improved such that it meets unlimited and unrestricted use, then that portion of the site can be excluded from future review. However, it is the policy of the EPA that five-year reviews be conducted on a site-wide basis whenever any portion of a site requires a review.

Comment #2 (oral - John Fitzgerald)

Mr. Fitzgerald asked if it was possible to have only one five-year review.

Response #2

At a minimum, one five-year review will be conducted. During that five-year review, it could be decided that no additional reviews are necessary.

Comment #3 (oral - John Fitzgerald)

Mr. Fitzgerald asked if there would be a record of when the five-year reviews will occur.

Response #3

CERCLA regulations do not require that the public be an active participant in the five-year reviews, but they do require that the results of the five-year reviews be made available to the public in the Information Repository. EPA guidance, however, suggests that the public be consulted during the five-year review process. While the Air Force has an active presence at the former Griffiss AFB, the Restoration Advisory Board (RAB) will be informed of and invited to participate in the five-year reviews.

Comment #4 (oral - John Fitzgerald)

For the record, Mr. Fitzgerald noted that he and other residents have concerns about the groundwater, but they understand that those issues will be addressed at a later time.

4 References

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__________, December 1982, *Installation Restoration Program Phase II - Problem Confirmation and Quantification Study Stage 1, Griffiss Air Force Base, Rome, New York*, prepared for United States Air Force, Brooks AFB, Texas.

Appendix D
(On-Base Groundwater LTM Report – November 2004

6 BUILDING 20 (SS-23)

6.1 SITE LOCATION AND HISTORY

Building 20 is located in the southeastern central part of the former Griffiss AFB (Figure 1-2). Building 20 is located at the northeast corner of Otis Street and Ellsworth Road, west of Lot 69 and the Coal Storage Yard AOC. Building 20 is the Locomotive Roundhouse, which was used to store and service diesel locomotives at the former Base. Lubricants and diesel locomotive parts were used and stored in the roundhouse, while PCB-containing hydraulic fluids were used in the locomotives. The site layout map is provided in Figure 6-1.

6.2 HYDROGEOLOGICAL SETTING

Building 20 is located in the central portion of the Base, along the southern margin of the industrial complex. The site vicinity is in an area of low topographic relief estimated at approximately 3 feet. The soils are predominantly composed of fine to medium sand with silt and/or gravel.

Building 20 is also located approximately 1,450 feet west of Rainbow Creek, which flows into Six Mile Creek, and approximately 1,500 feet northeast of Three Mile Creek. The run-off from the west portion of the Building 20 site flows to Three Mile Creek, and run-off from the east portion of the Site flows to Six Mile Creek.

Groundwater elevation data was collected from wells in the vicinity of the Building 20 in March 2003. The average depth to groundwater in the area ranged from 7.85 to 10.44 ft bgs. The hydraulic gradient indicates that the groundwater flow in the general Building 20 area is towards the southeast. Previous groundwater elevation measurements collected in April 2001 indicated that groundwater flow direction at the site is towards the northwest. The discrepancy in groundwater flow directions is caused by the fact that the Building 20 site is located on a groundwater divide and the groundwater flow direction is influenced by seasonal amounts of precipitation is the recent past. Secondly, large parts of the surrounding areas around Building 20 are covered with asphalt or cement, which hampers groundwater recharge in many areas.

The hydraulic conductivity at the Building 20 area is calculated to be 2.08 $x10^{-2}$ feet per minute. Based on the hydraulic conductivity, a modeled hydraulic gradient of 0.0018 feet/foot, and an estimated porosity of 20 percent, the groundwater flow rate was calculated to be 98.39 feet per year (LAW engineering and environmental services [LAW], December 1996).

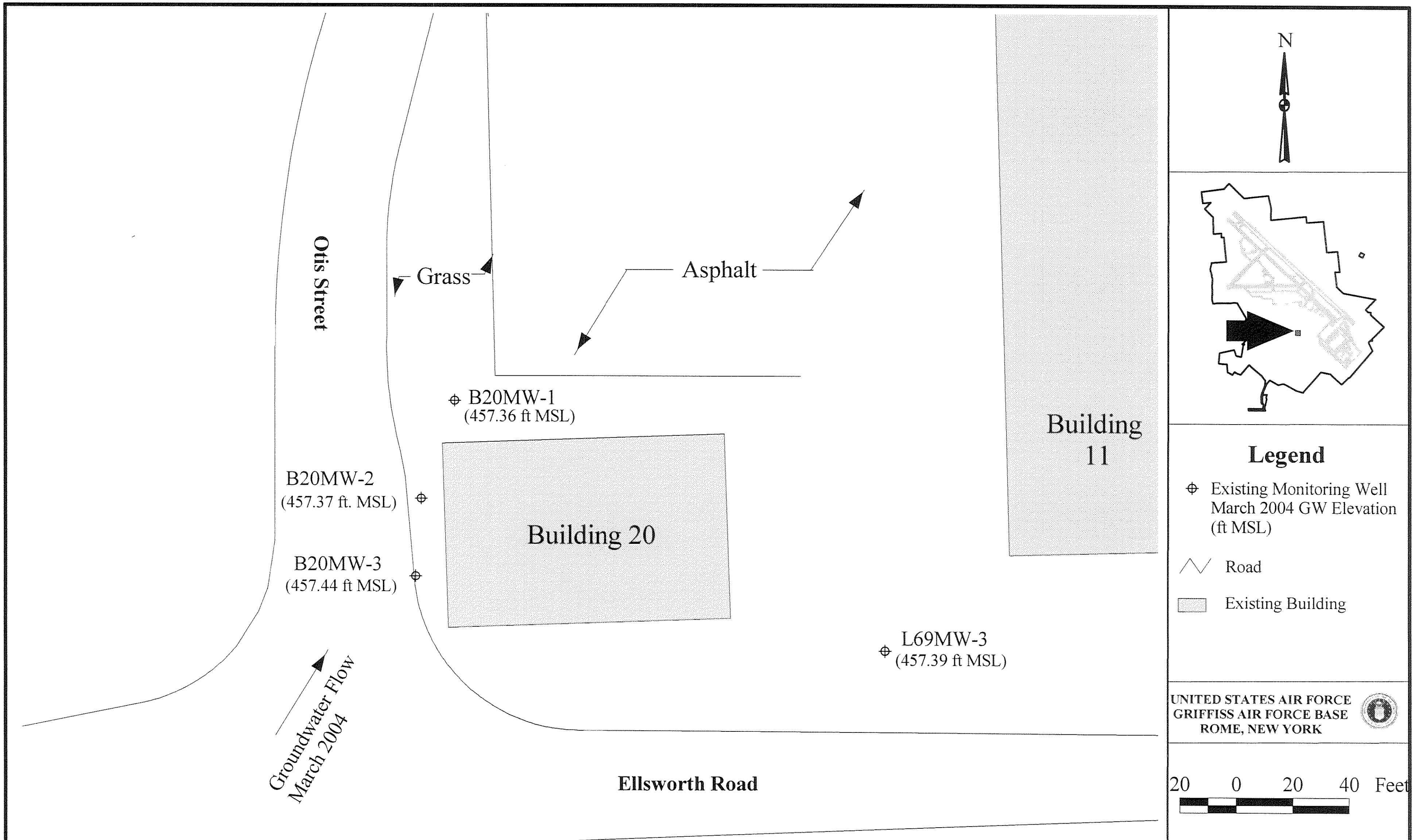

Figure 6-1
Building 20
Site Layout Map

6.3 SUMMARY OF PREVIOUS INVESTIGATIONS

In 1985, during the renovation of Building 20, the steam distribution system and the floor drain system were found to have developed a break which allowed waste fluids to leak into a cavity beneath the floor. This was found after a construction contractor encountered a concrete conduit that housed a previously abandoned steam line, and upon penetration of the foundation, approximately 150 to 200 gallons of a free-flowing oily liquid entered the excavation. All recoverable liquid, contaminated soil, concrete, and debris encountered were containerized into 55-gallon drums (for a total of 16 drums of liquid and 141 drums of solid waste), and disposed of by the Air Force in 1987. The excavated material was analyzed and found to contain 109 ppm PCBs, 700 ppm lead, and 446,000 ppm oil and grease.

In 1986, a subsurface investigation was conducted in the vicinity of the northwest corner of Building 20. Five soil borings were advanced through the concrete floor inside the building and one grab groundwater sampled was collected from each soil boring. One permanent monitoring well, B20MW-1, was installed approximately 10 feet from the northwest corner of the Building (however, no groundwater samples were collected from the well during this event). Soil sampling results revealed residual hydrocarbon contamination in all borings and residual metals near the surface in the northwest and southwest corners of the building.

In 1992, as part of the 1992/1993 quarterly sampling programs, B20MW-1 was sampled on a quarterly basis. Three VOCs [acetone, chloromethane, and methylene chloride], one SVOC (diethylphthalate), and ten metals [barium, calcium, chromium, iron, magnesium, manganese, nickel, potassium, sodium and zinc] were detected; glycols were reported during two of the four sampling events.

In 1994, an RI was performed at the Building 20, and included the installation of six soil borings; the collection of one grab groundwater sample from one of the soil borings; the installation and sampling of two groundwater wells (B20MW-2 and -3); and the sampling of the existing well B20MW-1. Groundwater samples indicated six SVOCs, one pesticide, seven metals, and petroleum hydrocarbons (TRPH) above the ARARs.

As part of the RI, a baseline risk assessment was performed to evaluate the current and future potential risks to human health and the environment associated with COCs found in the soils and groundwater at the site. Highest risk levels (carcinogenic and noncarcinogenic) were associated with exposure by industrial workers to contaminants in groundwater. The total carcinogenic risk was 1×10^{-4}, equal to the upper end of the EPA's target risk range, and the hazard index was 2.0, which is above the acceptable level of 1. For carcinogenic risk, the ingestion of groundwater pathway indicated arsenic as the main risk driver, and the dermal contact with groundwater pathway indicated benzo(a)pyrene as the main risk driver. For noncarcinogenic risk, the incidental ingestion of groundwater pathway indicated thallium, manganese, antimony, and arsenic as the main risk drivers (LAW, December 1996).

In 1998, an IRA was performed based on the RI results. To mitigate the majority of the contamination at Building 20, the concrete floor was cut, pipes were removed and the contaminated soil beneath the northwest corner of the building was stockpiled. Confirmatory samples were compared to TAGM 4046 and they verified the IRA's effectiveness. The Air Force, EPA, and NYSDEC agreed that project goals had been met and the excavation area was backfilled and the concrete floor replaced.

6.4 BUILDING 20 GROUNDWATER SAMPLING PLAN

Table 6-1 summarizes the groundwater monitoring sampling and analysis plan. The objectives of the Building 20 groundwater monitoring program include the following:

- Monitor the COC levels across the Building 20 AOC;
- Monitor the attenuation of COCs at Building 20 AOC;
- Confirm that metal detections were isolated and that concentration levels remain below the NYS Groundwater Standards; and
- Confirm that metals concentrations are stabilizing or decreasing.

6.5 GROUNDWATER SAMPLING RESULTS 2001 THROUGH 2004

FPM performed annual groundwater sampling at Building 20 in April 2001, March 2002, March 2003, and March 2004. Table 6-2 shows the results of the April 2001, March 2002, March 2003, and March 2004 sampling events for each sampling location. The field sampling forms are attached in Appendix A and the validated data are attached in Appendix C. The raw lab data are included in Appendix D.

<u>April 2001:</u>
In April 2001, monitoring wells B20MW-1, -2, and -3 were sampled using a peristaltic pump and applying the low-flow sampling method; samples were submitted to the laboratory for analysis for SVOCs [EPA method SW8270C], total and dissolved metals [EPA Method SW6010B], including lead [EPA Method SW7421] and mercury [EPA Method SW7470A]. No SVOCs were detected in any of the sampling locations. Exceedances of the NYS Groundwater Standards were reported for total iron, total sodium, dissolved sodium, dissolved selenium, and total manganese. Each of the three monitoring wells contained exceedances.

- Minimum metals exceedance: 10.9 F µg/L for selenium in the dissolved sample from B20MW-2 (NYS Groundwater Standard is 10 µg/L).
- Maximum metals exceedance: 340,000 µg/L for sodium in the total metals sample for monitoring well B20MW-3 (NYS Groundwater Standards is 20,000 µg/L).

Table 6-1
Building 20 Groundwater Monitoring Sample Analysis Summary

Sampling Locations	Screen Interval Depth (ft MSL)	Sampling Rationale	Target Analytes/ EPA Method Numbers	# of Samples[1]	Sampling Frequency	Evaluation Criteria
B20MW-1 B20MW-2 B20MW-3	457.19' – 447.19' 457.85' – 447.85' 457.77' – 447.77'	Downgradient Crossgradient Crossgradient	SVOCs-(AFCEE QAPP 3.1 List) / EPA Method SW 8270. Total and Dissolved Metals – (AFCEE QAPP 3.1 List plus mercury) / EPA Method 6010 and 7470/7471.	3	Annually	An Explanation of Significant Differences (ESD) of the existing Record of Decision (ROD) may be considered if no exceedances of NYS Groundwater or Base background levels are reported.

Notes:
[1] Please refer to the FSP for details concerning the number of QA/QC samples and their locations. At least one MS/MSD and two field duplicates were collected per SDG; one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs.

Table 6-2
B20MW-1 Groundwater Sampling Results
April 2001, March 2002, March 2003, and March 2004

Sample Location	**NYSDEC GW Standards (µg/L)**	**B20MW-1**							
Sample ID		**B20M0110AA**		**B20M0110BA**		**B20M0112CA**		**B20M0111DA**	
Date of Collection		**4/18/01**		**3/5/02**		**3/6/03**		**3/23/04**	
Water Depth (ft BTOIC)		**10.01**		**10**		**10.44**		**9.83**	
SVOCs (µg/L)									
No SVOCs were detected.									
Metals (µg/L)		**Total**	**Dissolved**	**Total**	**Dissolved**	**Total**	**Dissolved**	**Total**	**Dissolved**
aluminum	--	1,520	U	346	U	643	25.0 F	544	U
antimony	3	U	U	U	U	U	U	U	U
arsenic	25	U	6.1 F	U	U	U	U	U	U
barium	1,000	48.4	28.3	37.7	30.3	31.3 F	22.4 F	50.0	42.5 F
beryllium	--	U	U	U	U	U	U	U	U
cadmium	5	1.1	U	U	U	U	U	U	U
calcium	--	75,200	66,500 B	63,300	61,100	42,900	40,400	77,600	74,400
chromium	50	28.8	U	8.8	U	79.3	3.9 F	5.5 F	1.9 F
cobalt	--	U	U	U	U	U	U	U	U
copper	200	11.3	U	U	U	6.0 F	2.7 F	8.0 F	6 F
iron	300	1,790	U	371	U	842	U	733	59.6 F
lead	25	2.3 F	U	U	U	U	U	U	U
magnesium	--	3,740	3,100	3,630	3,680	3,120	2,980	4,240	4,080
manganese	300	141	1.1 F	26.2	1.4 F	45.8	0.60 F	116	6.9 F
mercury	0.7	U	U	U	U	U	U	U	U
molybdenum	--	U	U	U	2.1 F	8.3 F	2.8 F	3.9 F	2.3 F
nickel	100	16.6	U	2.7 F	2.8 F	7.8 F	U	11.6 F	3.2 F
potassium	--	16,300	18,900	15,400	19,400	15,400	15,800	17,500	17,200
selenium	10	U	8.1	U	U	U	U	U	U
silver	50	U	U	U	U	U	U	U	U
sodium	20,000	152,000	195,000	195,000	199,000	160,000	167,000	151,000	151,000
thallium	--	U	U	U	U	U	U	U	U
vanadium	--	1.9 F	U	U	U	2.2 F	U	1.5 F	U
zinc	--	9.6 F	U	5.7 F	14.7 F	6.1 F	1.4 F	8.3 F	9.2 F

Notes:
No SVOCs were detected above the method detection limits (MDLs).
B - Result is a positive value, however analyte was detected in associated blank at concentration above the RL.
F - Analyte detected above the MDL, but below the RL.
U - Analyte analyzed for, but not detected. The associated numerical value is at or below the method detection limit.
-- Indicates no NYS Class GA Groundwater Standard.
- Indicates analyte was detected above NYS Class GA Groundwater Standard.

Table 6-2 (Continued)
B20MW-2 Groundwater Sampling Results
April 2001, March 2002, March 2003, and March 2004

Sample Location	**NYSDEC**	**B20MW-2**							
Sample ID	**GW**	**B20M0207AA**		**B20M0208BA**		**B20MW0213CA**		**B20M0209DA**	
Date of Collection	**Standards**	**4/18/01**		**3/5/02**		**3/6/03**		**3/23/04**	
Water Depth (ft BTOIC)	**(µg/L)**	**7.44**		**8**		**7.99**		**7.72**	
SVOCs (µg/L)									
No SVOCs were detected.									
Metals (µg/L)		**Total**	**Dissolved**	**Total**	**Dissolved**	**Total**	**Dissolved**	**Total**	**Dissolved**
aluminum	--	192 F	U	120 F	34.9 F	2,570	23.9 F	76.6 F	U
antimony	3	U	U	U	U	U	U	U	U
arsenic	25	U	8 F	U	U	U	U	U	U
barium	1,000	23.2	22.9	25.8	23.9	32.0 F	18.0 F	16.1 F	16 F
beryllium	--	U	U	U	U	U	U	0.30 F	U
cadmium	5	U	U	U	U	0.60 F	U	U	U
calcium	--	109,000 M	108,000 B	117,000	111,000	93,600	93,800	83,600	87,100
chromium	50	15.7	U	2.1 F	U	60.4	1.8 F	3.1 F	U
cobalt	--	U	U	U	U	6.4 F	U	1.5 F	U
copper	200	U	U	U	U	8.2 F	U	3.0 F	4.3 F
iron	300	362	U	216	U	4,220	32.2 F	165 F	U
lead	25	U	U	U	U	U	U	U	U
magnesium	--	30,100	30,100	30,400	30,200	27,700	27,500	24,300	25,500
manganese	300	268	197	166	148	1,160	3.3 F	286	15.0
mercury	0.7	U	U	U	U	U	U	U	U
molybdenum	--	U	2.3 F	U	2.9 F	U	1.5 F	U	U
nickel	100	4.8 F	2.1 F	U	2.9 F	13.1 F	U	U	U
potassium	--	3,260	3200	2,050	2,680	2,990	2,130	2,080 F	2,140 F
selenium	10	U	10.9 F	U	8.1 F	U	U	U	U
silver	50	U	U	U	U	U	U	U	U
sodium	20,000	190,000 M	14,600	209,000	211,000	189,000	196,000	190,000	195,000
thallium	--	U	U	U	U	U	U	U	U
vanadium	--	U	U	U	U	5.0 F	U	U	U
zinc	--	9.4 F	4.8 F	U	21.5 F	15.5 F	1.2 F	U	U

Notes:
No SVOCs were detected above the method detection limits (MDLs).
B - Result is a positive value, however analyte was detected in associated blank at concentration above the RL.
F - Analyte detected above the MDL, but below the RL.
M - Matrix effect present.
U - Analyte analyzed for, but not detected. The associated numerical value is at or below the method detection limit.
-- Indicates no NYS Class GA Groundwater Standard.
- Indicates analyte was detected above NYS Class GA Groundwater Standard.

Table 6-2 (Continued)
B20MW-2 Groundwater Sampling Results
April 2001, March 2002, March 2003, and March 2004

Sample Location	**NYSDEC**	**B20MW-3**							
Sample ID	**GW**	**B20M0307AA**		**B20M0308BA**		**B20M0313CA**		**B20M0309DA**	
Date of Collection	**Standards**	**4/18/01**		**3/5/02**		**3/6/03**		**3/23/04**	
Water Depth (ft BTOIC)	**(µg/L)**	**7.30**		**8**		**7.85**		**7.58**	
SVOCs (µg/L)									
No SVOCs were detected.									
Metals (µg/L)		**Total**	**Dissolved**	**Total**	**Dissolved**	**Total**	**Dissolved**	**Total**	**Dissolved**
aluminum	--	252 J♦	U	806	U	2,610	U	103 F	U
antimony	3	U	U	U	U	U	U	U	U
arsenic	25	U	6.4 F♦	U	3.5 F	U	U	U	U
barium	1,000	41.2	37.9	60.2	49.5	51.7	21.0 F	47.1 F	46.0 F
beryllium	--	U	U	U	U	U	U	0.50 F	U
cadmium	5	U	U	U	U	7.3	U	0.80 F	U
calcium	--	131,000	125,000 B	140,000	136,000 M	65,000	62,400 M	93.400	90,100
chromium	50	46.4♦	U	68.6	U	348	3.3 F	13.6	1.5 F
cobalt	--	U	U	U	U	6.0 F	U	U	U
copper	200	13	U	U	U	22.7	2.1 F♦	5.1 F	6 F
iron	300	862 J♦	U	2,120	U	5,800	50.4 F♦	401	U
lead	25	U	U	U	U	6.0 F	U	U	U
magnesium	--	15,400	14,600	11,700	11,700	8,080	7,360♦	6,680	6,610
manganese	300	442♦	3.4	491	6.2	2,190	8.3 F♦	282	18.7
mercury	0.7	U	U	U	U	U	U	U	U
molybdenum	--	3.7 F♦	2.2 F	U	U	16.4	2.1 F	U	U
nickel	100	20.2♦	6.7 F*	26.1	3.7 F	95.4	4.0 F♦	8.0 F	U
potassium	--	4010	4270	3,200	4,670 M	3,360	2,390	3,360 F	2,980 F
selenium	10	U	U	U	11.6 F	U	U	U	U
silver	50	2.1 F	U	U	U	U	U	U	U
sodium	20,000	340,000	296,000	574,000	569,000 M	356,000	364,000	552,000	580,000
thallium	--	U	U	U	U	U	U	U	U
vanadium	--	U	U	1.8 F	U	7.0 F	U	U	U
zinc	--	9.5 F	12.9 F♦	7.8 F	12.3 F	30.4	1.2 F	9.2 F	8.3 F

Notes:
No SVOCs were detected above the method detection limits (MDLs).
B - Result is a positive value, however analyte was detected in associated blank at concentration above the RL.
F - Analyte detected above the MDL, but below the RL.
M - Matrix effect present.
U - Analyte analyzed for, but not detected. The associated numerical value is at or below the method detection limit.
-- Indicates no NYS Class GA Groundwater Standard.
♦ Higher numerical value taken from sample duplicate
- Indicates analyte was detected above NYS Class GA Groundwater Standard.

March 2002:
In March 2002, monitoring wells B20MW-1, -2, and -3 were monitored for SVOCs (SW8270 List), and total and dissolved metals (SW6010 list plus mercury). Total metals analyses were performed on raw groundwater that contained suspended solids, and dissolved metals analyses were performed on the groundwater after it was filtered (and thus contained no suspended solids). The groundwater analytical results for SVOCs indicated no detections at sampling locations B020MW-1, -2, and -3. Exceedances of the NYS Groundwater Standards were reported for total iron, total sodium, dissolved sodium, dissolved selenium, total manganese, and total chromium. Each of the three monitoring wells contained exceedances.

- Minimum metals exceedance: 11.6 F µg/L for selenium in the dissolved sample from B20MW-3.
- Maximum metals exceedance: 574,000 µg/L for sodium in the total metals sample for monitoring well B20MW-3.

Since the “total” metals results were reported non-detect for selenium in all wells sampled during the 2001 and 2002 sampling rounds, the presence of selenium in the “dissolved” samples for B20MW-2 and -3 is likely an artifact of the filtering process or the sample handling in the laboratory. Furthermore, according to the NYSDEC Technical and Administrative Guidance Manual (TAGM) #4015 (Policy Regarding Alteration of Groundwater Samples Collected for Metals Analysis), if unfiltered samples meet applicable standards or requirements, there is no need to analyze a filtered sample. Given that the unfiltered sample results for selenium were “non-detect” for these two sampling locations, selenium is not deemed a constituent of concern at this site.

March 2003:
In March 2003, monitoring wells B20MW-1, -2, and -3 were sampled and analyzed for SVOCs (SW8270) and total and dissolved metals (SW6010 list plus mercury). Exceedances of the NYS Groundwater Standards were reported for total chromium, total iron, total sodium, dissolved sodium, total manganese, and total cadmium

Each of the three monitoring wells contained exceedances.

- Minimum metals exceedance: 7.3 µg/L for cadmium in the total sample from B20MW-3.
- Maximum metals exceedance: 364,000 µg/L for sodium in the total metals sample for monitoring well B20MW-3.

March 2004:
In March 2004, monitoring wells B20MW-1, -2, and -3 were sampled and analyzed for SVOCs (SW8270) and total and dissolved metals (SW6010 list plus mercury). No SVOC exceedances or detections were reported in any of the samples. Exceedances of the NYS Groundwater

Standards were reported for total iron in B20MW-1, and total and dissolved sodium in all three monitoring wells.

- Minimum metals exceedance: 733 µg/L for iron in the total sample from B20MW-1 (NYS Groundwater Standard is 300 µg/L).
- Maximum metals exceedance: 588,000 µg/L for sodium in the dissolved metals sample for monitoring well B20MW-3.

6.6 CONCLUSIONS AND MONITORING RECOMMENDATIONS

The exceedances reported for iron, manganese, and sodium have been reported in numerous previous reports and are likely indicative of site background conditions. The chromium exceedances were only reported in the total analysis samples. No chromium exceedances were reported in the dissolved samples. These exceedances can be attributed to the suspended solids present in the total analysis samples and were not duplicated during the most recent sampling round. The cadmium exceedance reported in the total analysis sample for B20MW-3 in the March 2003 sampling round is most likely an anomaly, since no exceedances and only one other detection have been reported for cadmium in any of the three sampling rounds.

Sodium exceedances were reported in all rounds in all samples and for both dissolved and total samples. These probably resulted from the infiltration of ice and snow melt water from the roads and parking lot adjacent to the Building 20 site on all four sides.

The most recent rounds of sampling conducted at the site indicate that no significant contamination remains. FPM recommends No Further Sampling (NFS) for the Building 20 site.