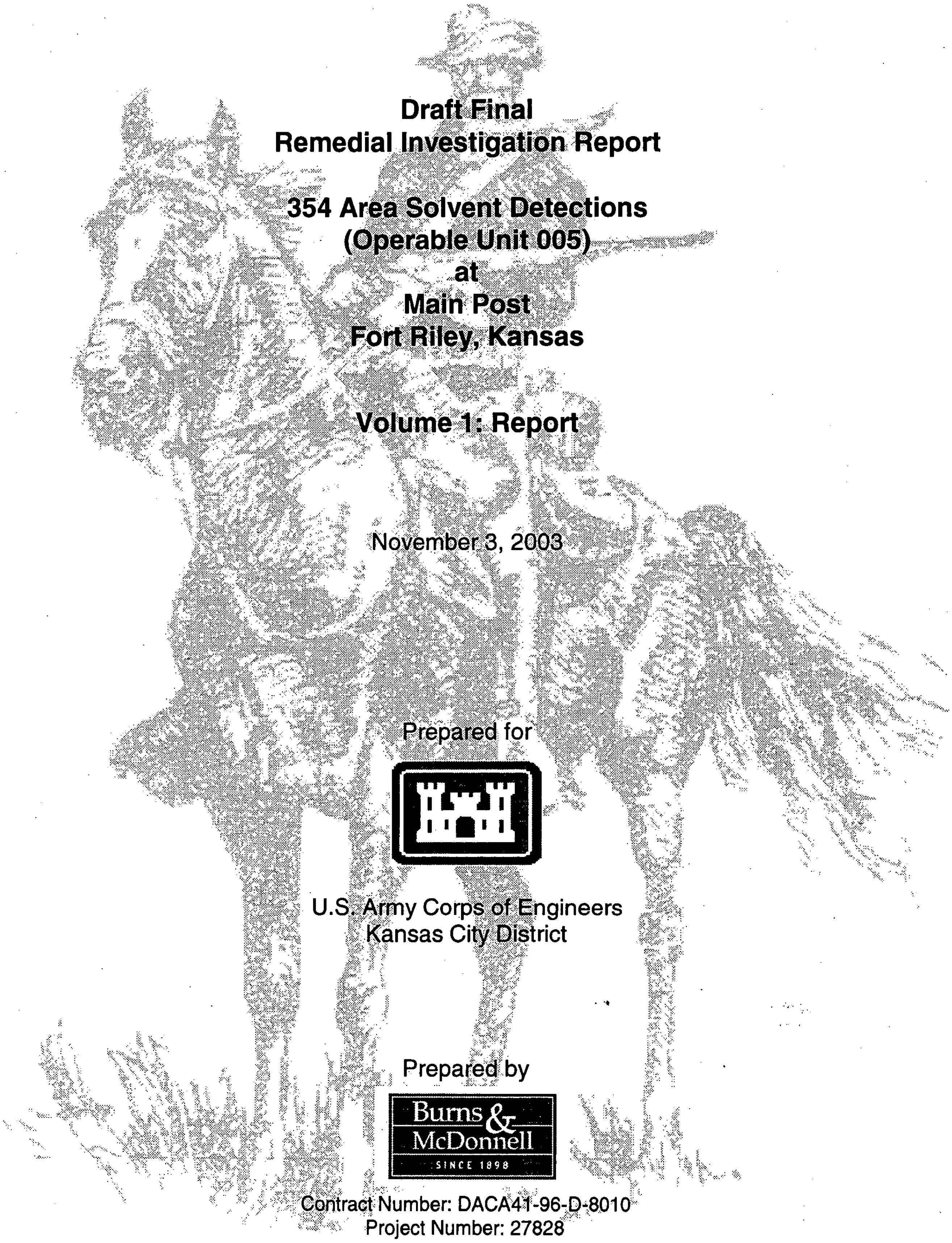

Draft Final
Remedial Investigation Report

354 Area Solvent Detections
(Operable Unit 005)
at
Main Post
Fort Riley, Kansas

Volume 1: Report

November 3, 2003

Prepared for

U.S. Army Corps of Engineers
Kansas City District

Prepared by

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LIST OF ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AFCEE	Air Force Center for Environmental Excellence
AGL	Abandoned Gas Line
AGL SI	Abandoned Gas Line Site Investigation
AOG	Alpha-Omega Geotech, Inc.
AOI	Area of Interest
ASTM	American Society of Testing Materials
ATSDR	Agency for Toxic Substances and Disease Registry
ATV	All Terrain Vehicle
bgs	below ground surface
BMcD	Burns & McDonnell Engineering Company, Inc.
BRAC	Base Realignment and Closure
BTEX	Benzene, Toluene, Ethylbenzene, and Total Xylenes
°C	degrees celcius
$CaCO_3$	Calcium Carbonate
CAS	Continental Analytical Services
CCl_4	Carbon Tetrachloride
CENWK	U.S. Army Corps of Engineers, Kansas City District
cfs	cubic feet per second
Cl	Chloride
cm^2	square centimeters
cm/sec	centimeters per second
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CO_2	Carbon Dioxide
COPC	Chemicals of Potential Concern
COPEC	Chemicals of Potential Ecological Concern
CSM	Conceptual Site Model
DA	Department of the Army
DCA	Dichloroethane
DCE	Dichloroethene
DCFA	Dry Cleaning Facilities Area
DCP	Data Collection Platform
DNAPL	Dense Non-Aqueous Phase Liquid
DES	Directorate of Environment and Safety
DETMWP	Data Evaluation Technical Memorandum and Work Plan
DO	Dissolved Oxygen
DoD	Department of Defense
DPW	Directorate of Public Works
DSR	Data Summary Report

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

E	Estimated Value
EDB	Ethylene Dibromide
EDI	Equal Discharge Increments
EHQ	Ecological Hazard Quotient
EPS	Environmental Priority Service
EWMC	Environmental Waste Management Center
°F	degrees fahrenheit
Fe (II)	Ferrous Iron
Fe (III)	Ferric Iron
FEMA	Federal Emergency Management Agency
FFA	Federal Facility Agreement
FFTA-MAAF	Former Fire Training Area, Marshall Army Airfield
FFTA-MAAF RI	Former Fire Training Area Remedial Investigation
ft	feet
ft/day	feet per day
FR	Federal Register
FSP	Field Sampling Plan
ft/ft	feet per foot
G	Gradient
GC	Gas Chromatograph
gpm	gallons per minute
GSI	Geocore Services Inc
H_2	Molecular Hydrogen
HEAST	Health Effects Assessment Summary Tables
HHBRA	Human Health Baseline Risk Assessment
HSA	Hollow-Stem Auger
IAG	Interagency Agreement
IARC	International Agency for Research on Cancer
IDW	Investigation Derived Waste
IFI	Initial Field Investigation
IFIR	Initial Field Investigation Report
in/yr	inches per year
IRIS	Integrated Risk Information System
IRP	Installation Restoration Program
IWSA	Installation Wide Site Assessment
J	Estimated (chemical analysis)
K	Hydraulic Conductivity
K_H	Henry's Law Constant
K_{OW}	Octanol-Water Partition Coefficient
KVE	Kaw Valley Engineering
KDHE	Kansas Department of Health and Environment
KDWP	Kansas Department of Wildlife and Parks

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

kg	kilogram
KSWQC	Kansas Surface Water Quality Criteria
KWO	Kansas Water Office
L	length
LBA	Louis Berger & Associates
LLNL	Lawrence Livermore National Laboratory
LNAPL	Light Non-Aqueous Phase Liquid
LOAELs	Lowest Observed Adverse Effect Levels
MAAF	Marshall Army Airfield
MCLs	Maximum Contaminant Levels
MF	Modifying Factors
mg	milligrams
mg/cm^2	milligrams per square centimeter
mg/day	milligrams per day
mg/kg	milligrams per kilogram
mg/kg/day	milligrams of chemical per kilogram body weight per day
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
m^3/day	cubic meters of air per day
m^3/hour	cubic meters of air per hour
MSL	Mean Sea Level
MS/MD	Matrix Spike/Matrix Spike Duplicate
MWIP	Monitoring Well Installation Plan
mV	millivolt
μg	microgram
μg/kg	micrograms per kilogram
μg/L	micrograms per liter
NA	Natural Attenuation
NAp	Not Applicable
NAWQC	National Ambient Water Quality Criteria
NCI	National Cancer Institute
NCP	National Contingency Plan
NO_2	Nitrite
NOAELs	No Observed Adverse Effect Levels
NPL	National Priority List
NRWQC	National Recommended Water Quality Criteria
NTU	Nephelometric Turbidity Units
NWI	National Wetlands Inventory
ORNL	Oak Ridge National Laboratory
ORP	Oxidation Reduction Potential
OU	Operational Unit
p	Effective Porosity
PAH	Polycyclic Aromatic Hydrocarbon

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

PAOC	Potential Area of Concern
PCE	Tetrachloroethene
PEF	Particle Emission Factor
PID	Photoionization Detector
POL	Petroleum, Oil, and Lubricant
PRG	Preliminary Remediation Goals
PSA	Preliminary Site Assessment
PSF	Pesticide Storage Facility
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
QCSR	Quality Control Summary Report
QCTM	Quality Control Technical Memorandum
R	Rejected (chemical analysis)
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RfC	Reference Concentration
RfD	Reference Dose
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RI/FS WP	Remedial Investigation/Feasibility Study Work Plan
RME	Reasonable Maximum Exposure
RSK	Risk-Based Standard
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SFL/CF	Southwest Funston Landfill/Camp Funston
SI	Site Investigation
354 SI	Building 354 Site Investigation
354 Site	354 Area Solvent Detections at Fort Riley, Kansas
SSAP	Site Specific Sampling and Analysis Plan
SSHP	Site Safety and Health Plan
STSC	Superfund Technical Support Center
SVE	Soil Vapor Extraction
SVOCs	Semivolatile Organic Compounds
T	time
TAL	Target Analyte List
TCA	Trichloroethane
TCE	Trichloroethene
TCL	Target Compound List
TEAPs	Terminal Electron-Accepting Processes
TEPH	Total Extractable Petroleum Hydrocarbons
TOC	Total Organic Carbon

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

TVOC	Total Volatile Organic Compounds
TPH	Total Petroleum Hydrocarbon
TPH-DRO	Total Petroleum Hydrocarbon - Diesel Range Organic
TPH-GRO	Total Petroleum Hydrocarbon - Gasoline Range Organic
TVPH	Total Volatile Petroleum Hydrocarbon
UCL	Upper Confidence Limit
UFs	Uncertainty Factors
UPRR	Union Pacific Railroad
USACE	United States Army Corps of Engineers
USAEHA	United States Army Environmental Hygiene Agency
USDoC	United States Department of Commerce
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tanks
V	velocity
VC	Vinyl Chloride
VF	Volatilization Factors
VOCs	Volatile Organic Compounds
WP	Work Plan
WRD	Water Resources Division

* * * * *

EXECUTIVE SUMMARY

Since 1990, Fort Riley has conducted several investigations to identify and delineate contamination associated with the 354 Area Solvent Detections (Operable Unit 005) and associated impacted areas (hereinafter collectively referred to as the 354 Site). Results from these investigations have indicated that releases of organic compounds have occurred at the 354 Site that could potentially pose a threat to human health and/or the environment. The purpose of this *Remedial Investigation (RI) Report* [RI Report] is to document the evaluation of current conditions as they pertain to potential threats to human health and the environment associated with the 354 Site. This RI Report was prepared by the Burns & McDonnell Engineering Company, Inc. (BMcD) under contract DACA41-96-D-8010 with the U.S. Army Corps of Engineers (USACE), Kansas City District (CENWK), and represents Fort Riley's ongoing fulfillment of obligations to investigate and take appropriate actions at sites posing a potential threat to human health and the environment.

The more developed areas of Fort Riley are in the southern portion of the reservation along the Republican and Kansas Rivers. The developed areas are divided into six cantonment areas, one of which is Main Post. The 354 Site currently encompasses portions of Main Post as far north as Godfrey Avenue, and virtually the entire point bar south of the Union Pacific Railroad (UPRR) grade and east of the Henry Drive Bridge. This point bar and an alluvial terrace dominate the topography across the study area. The point bar is part of the active floodplain and consists of approximately 60-feet (ft) of alluvial sediments overlying shale or limestone bedrock. The terrace, located to the north of the railroad grade, also consists of alluvial sediments deposited on shale and limestone bedrock; however, this area is topographically higher than the floodplain and the unconsolidated terrace deposits vary in thickness from nine to 64-ft.

Unconfined groundwater is present within both the terrace deposits (terrace aquifer) and the Kansas River alluvium (Kansas River alluvial aquifer). Groundwater within the terrace aquifer is present directly above the bedrock surface, with a saturated thickness ranging from zero (dry) to about 16-ft. Groundwater flow is controlled by the topography of the bedrock surface, which imparts a southerly direction of groundwater flow. The thickness of saturated material within the Kansas River alluvial aquifer is greater, up to 35-ft in some areas. Groundwater flow here is controlled in large part by the Kansas River and is to the east/southeast, across the point bar. Permeability of the terrace and alluvial sediments is probably very similar; however, transmissivity is greater in the Kansas River alluvium since the saturated thickness is greater. Groundwater gradients are an order of magnitude greater within the terrace aquifer than within the Kansas River alluvial aquifer.

Large capacity supply wells completed in the alluvial deposits of the Kansas River provide the water required for virtually all areas of Fort Riley. These supply wells are located upstream from the 354 Site. There are no supply wells located in either the terrace or Kansas River alluvial aquifer at the 354 Site. Because of the very low transmissivity of the terrace aquifer and the prolific supply available from the Kansas River alluvial aquifer, it is unlikely that supply wells will ever be completed within the terrace deposits.

Over the years, a variety of activities have been conducted at the 354 Site, which could have resulted in sources of both chlorinated solvent and hydrocarbon contamination. These include facilities for the storage and maintenance of motorized equipment, facilities for storing and dispensing fuel and oil for vehicles, and at least one area where fire fighting equipment may have been serviced or used for training. Specific areas identified as possible source areas include the following:

- Building 367 and adjacent paved areas.
- Building 332, former Building 354, its associated underground storage tanks (USTs), and adjacent areas of Directorate of Public Works (DPW) Compound.
- Building 430.
- Former service station to northwest of UPRR depot.
- Petroleum unloading facility and pipeline along the UPRR grade.

A number of field investigations have been conducted at the 354 Site. These investigations, beginning in 1992, included collection and chemical analysis of soil-gas samples, groundwater-screening samples, soil samples, and groundwater samples at the 354 Site. Monitoring wells were also installed and sampled at the 354 Site. Results indicated that petroleum hydrocarbons and chlorinated solvents, including tetrachloroethene (PCE), trichloroethene (TCE), and cis-1,2-dichloroethene (cis-1,2-DCE), were present in the soil and groundwater at the 354 Site. Benzene, toluene, ethylbenzene, and xylenes (BTEX) have been detected in the study area, specifically at and downgradient of the former Building 354 location. Because the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) excludes petroleum, the BTEX and polycyclic aromatic hydrocarbon (PAH) contamination found in this study area are a secondary issue to the RI. However, the petroleum constituents will be addressed in this report; therefore, the risk assessed for the 354 Site is considered cumulative.

The primary chlorinated solvent source appears to be located immediately east of Building 367. This source appears to be principally PCE, based on both soil and groundwater data. TCE and cis-1,2-DCE are present as well, but at significantly lower levels. Secondary chlorinated solvent sources may exist in the vicinity of Building 332 and the DPW Compound, and Building 430. There are sources of BTEX contamination in the vicinity of Building 332, the former Building 354, and along the UPRR grade (petroleum unloading facility), based on both soil and groundwater evidence. PAHs, at low concentrations, were detected in soil collected from the vicinity of Building 367, Building 430, and former Building 354/Building 332/DPW Compound areas.

Chlorinated solvents, including PCE, TCE, and cis-1,2-DCE, are present in soils at the 354 Site. The primary source area appears to be located just east of Building 367, where high concentrations of PCE in soil have been detected. Some chlorinated solvent contamination is also present in the vicinity of the DPW Compound. Petroleum compounds (i.e. BTEX and PAHs) are present in soils in the vicinity of the DPW Compound and also in soils from the vicinity of the former service station along Dickman Avenue.

Chlorinated solvents, including PCE, TCE, cis-1,2-DCE, and carbon tetrachloride (CCl_4), have been detected in groundwater from both the terrace and Kansas River alluvial aquifers. The highest concentrations of these compounds have been detected in groundwater samples collected from the terrace aquifer immediately east and downgradient of Building 367. These compounds are also present in the Kansas River alluvial aquifer, but at significantly lower concentrations. Petroleum compounds are present locally, mainly in samples collected from monitoring wells at and immediately south of the DPW Compound. Although very low concentrations of cis-1,2-DCE have been detected at monitoring wells immediately adjacent to the Kansas River, contaminants have not been detected in surface water samples collected from the Kansas River.

Arsenic, barium, chromium, lead, and mercury were detected in the groundwater at the 354 Site. Only arsenic and lead were detected at concentrations in excess of U.S. Environmental Protection Agency (USEPA) maximum contaminant level (MCL) or action level (in the case of lead). These detections were all located within or immediately adjacent to the Kansas River alluvial aquifer. The lack of detections in terrace monitoring wells suggested that these were not site-related contaminants. Because groundwater is not considered useable as a drinking water source and is generally too deep to be directly contacted, metals in groundwater were not evaluated quantitatively as part of the human health risk assessment. Arsenic, barium, cadmium, chromium, and lead were detected in soils at the 354 Site. Metals in soils were generally detected at concentrations below regional background levels, with the exception of lead. However, the detected concentrations of lead in soil were below regulatory screening levels. Since most metals in soil were detected at concentrations below background, and the detected concentrations of all metals were below regulatory screening levels, no metals in soil were retained as chemicals of potential concern (COPCs). However, in accordance with recent USEPA guidance and USACE policy, an evaluation of potential human health risks associated with exposure to background levels of metals was added to the discussion of uncertainties. No specific sources for metals have been identified at the 354 Site; however, tetraethyl lead was once a common fuel additive.

Chlorinated solvent contamination is transported south within the terrace aquifer to the Kansas River alluvial aquifer. Advection appears to be the dominant transport process. Adsorption is probably also contributing significantly to the reduction of PCE mass in groundwater, with volatilization possibly playing a minor role. Based on an evaluation of natural attenuation (NA) parameters and the contaminant chemistry, it appears that little or no biotransformation of chlorinated solvents is occurring within the terrace aquifer. Dissolved oxygen (DO), oxidation-reduction potential (ORP), and nitrate levels are high, while ferrous iron levels remain low, all suggesting an environment unsuitable for reductive dechlorination. This is confirmed by high levels of PCE within the groundwater, and modest amounts of the daughter products (TCE and cis-1,2-DCE) present.

Once the contaminant plume intersects the Kansas River alluvial aquifer, environmental conditions change. The direction of transport becomes easterly, moving with the general direction of flow of the Kansas River. Dispersion becomes more significant, relative to advection, as groundwater flow velocities tend to be only one-tenth of those within the terrace aquifer. Within the Kansas River alluvial aquifer, conditions improve for the performance of reductive dechlorination. DO, ORP, and nitrate levels drop significantly, as ferrous iron levels increase, suggesting that environmental conditions improve greatly for reductive dechlorination. In addition, PCE disappears shortly after entering the Kansas River alluvial aquifer, to be replaced with TCE, and finally cis-1,2-DCE.

cis-1,2-DCE is less amenable to dechlorination in an anaerobic reducing environment, compared to PCE and TCE. In this system, it appears that once the degradation pathway reaches cis-1,2-DCE, the dechlorination process slows, leaving cis-1,2-DCE to be further attenuated by advection and dispersion. The absence of vinyl chloride throughout the plume and ethane/ethene also suggests a stalling of the reductive dechlorination process at cis-1,2-DCE. Another factor influencing reductive dechlorination is the availability of primary carbon sources to act as electron donors. BTEX is present in groundwater in the area where the plume enters the Kansas River alluvial aquifer, but is not present downgradient. These organics can serve as a primary substrate for microorganisms facilitating reductive dechlorination. As BTEX is degraded, the reduction of chlorinated substances stalls, leaving cis-1,2-DCE. Total organic carbon (TOC) levels are below the 20 milligrams per liter (mg/L) threshold considered optimal for reductive dechlorination, which may inhibit the continued dechlorination of cis-1,2-DCE.

The potential for human health risk from exposure to chemicals at the 354 Site was considered for the soil, groundwater, and air media. COPCs at the 354 Site include the following: PCE and related compounds (TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE, and vinyl chloride), 1,1,2-trichloroethane, CCl_4 and related compound chloroform, BTEX petroleum constituents, acetone, and carbon disulfide. Because there are three distinct areas of contamination at the 354 Site, risk was evaluated separately for the Building 367 Area, the Building 354/332/DPW Compound Area, and the Building 430 Area. Based on observed 354 Site conditions, it was concluded that current and potential future populations could be exposed to site-related constituents through direct contact with soil and/or inhalation of chemical vapors from soil, soil gas, and groundwater. Potential intakes of the COPCs were calculated using standard USEPA equations for intake from ingestion, dermal contact, and inhalation of contaminants. Cancer and noncancer risks were calculated for the following scenarios: current indoor worker exposure to vapors from soil or groundwater (Building 367 and Building 354/332/DPW Compound Areas); future utility excavation worker exposure to impacted soil and vapors from soil or groundwater while excavating (Building 367 Area); current groundskeeper exposure to impacted soil and vapors from soil or groundwater while mowing (Building 354/332/DPW Compound Area); and current child resident exposure to impacted soil and vapors (Building 430 Area) from soil gas or groundwater.

For exposure concentrations, 95 percent upper confidence limits (UCLs) of the mean were calculated assuming log normally distributed soil and groundwater data. Exposure concentrations represented the lower of either the 95 percent UCL or maximum detected concentration. In the Building 367 and Building 430 Areas, the exposure concentrations were predominantly represented by 95 percent UCLs, whereas maximum detected concentrations were primarily used in the Building 354/332/DPW Compound Area. For exposure concentrations that might be experienced in the future by a utility excavation worker, soil chemical concentrations under current conditions were assumed. Vapor concentrations used in the exposure calculations were determined by modeling contaminant partitioning from soil and/or groundwater to soil gas, migration of soil gas to the surface, and dilution in the breathing zone at the receptor point. Since vapor migration is a competitive process, it would be duplicative to evaluate inhalation of vapors from both media. Therefore, the higher of the two vapor concentrations was used in the vapor inhalation intake calculations.

The results of the risk characterization indicate that the excess cancer risks for all populations evaluated were below the USEPA's allowable levels. The hazard indices for the populations assessed were also below the USEPA's level of concern.

Uncertainties in the risk assessment process were evaluated. It was concluded that, when combined, the uncertainty associated with each step most likely resulted in a conservative overestimate of risk, particularly in the Building 354/332/DPW Compound Area where risk calculations were based primarily on maximum chemical concentrations.

The potential for ecological risk from exposure to chemicals at the 354 Site was considered for soil and groundwater media. Based upon observed Site conditions, it was concluded that flora and fauna could be exposed to site-related constituents through direct contact and/or ingestion of soil and groundwater. Chemicals of potential ecological concern (COPECs) identified included PAHs in soils and VOCs in groundwater. The impacts of the COPECs upon potential receptors were assessed qualitatively and by a quantitative screening.

The site was evaluated for the presence of ecological receptors and completed ecological exposure pathways. Ecological receptors and/or completed exposure pathways were identified within the terrace area (main operational portion) of the 354 Site. Completed exposure pathways for terrestrial ecological receptors were not identified in the point bar area of the 354 Site because the contaminant sources at the 354 Site include spills and underground storage tanks associated with Buildings 430, 367, 332, and 354 in the terrace area. None of the spills and underground storage tanks associated with these buildings are in the point bar area. Since habitat is limited and human activity makes the area unattractive for the establishment of natural communities, soil and groundwater in the terrace area of the 354 Site were not evaluated due to a lack of completed exposure pathways. Therefore, COPECs at this location present no ecological risk. Groundwater was evaluated in the point bar area of the Site due to the aquatic communities observed in the Kansas River.

Potentially completed exposure pathways were identified at the 354 Site, and these pathways were evaluated. Representative terrestrial receptors (short-tailed shrew, white-footed mouse, meadow vole, cottontail rabbit, red fox, and white-tailed deer) were assessed semi-quantitatively. The preliminary screening did not provide any indications of adverse ecological effect from exposure to soil contamination. All other terrestrial receptors, including plants and soil organisms, were qualitatively assessed and determined to exhibit no adverse effects. The qualitative risk characterization was based on the lack of any visible adverse effects within the plant and animal communities of the 354 Site. Based on the results of the semi-quantitative and qualitative evaluations of soil contaminants, ecological risk to terrestrial flora and fauna inhabiting the 354 Site is expected to be insignificant. Additionally, protected species are unlikely to experience adverse effects due to incidental contact with contaminated soil. The future presence of any protected species in the contaminated areas at the 354 Site is likely to be transitory.

Potential for risk to benthic organisms inhabiting the Kansas River was assessed quantitatively. Existing chemical concentrations in groundwater near the Kansas River (as measured in samples collected from monitoring wells within the point bar area of the 354 Site) were compared to benchmark values for benthic organisms. The maximum detected concentrations of VOCs in groundwater near the Kansas River were below the benchmarks used for this evaluation. Therefore, current VOC concentration conditions within the point bar area of the 354 Site are unlikely to pose appreciable risk to benthic organisms in the Kansas River.

Critical habitat for the bald eagle, piping plover, and interior least tern occurs along the Kansas River at the southern edge of the 354 Site. Bald eagles are migratory and known to winter along the Kansas River. Both the piping plover and the interior least tern are seasonal inhabitants along the Kansas River. Although the food gathered along the Kansas River may make up a significant dietary component of wintering bald eagles, and piping plovers and interior least terns, the approximate one-mile stretch of the Kansas River in the 354 Site would only account for approximately one-quarter to one-half of each species' foraging range. Only minimal exposure to arsenic would be expected due to the short amount of time these species spend along the Kansas River at the 354 Site and the relatively low concentrations detected in the point bar north of the Kansas River. Risk to bald eagles, piping plovers, and interior least terns in the vicinity of the 354 Site are most likely insignificant.

Risks to other state and federally listed species known to occur in Riley County are also likely to be insignificant.

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1.0 INTRODUCTION

1.1 PURPOSE OF REPORT

The purpose of this *Remedial Investigation (RI) Report* [RI Report] is to document the evaluation of current conditions as they pertain to potential threats to human health and the environment associated with the 354 Area Solvent Detections (Operable Unit 005) on Main Post, Fort Riley, Kansas. This RI Report was developed in support of the Fort Riley Directorate of Environment and Safety (DES) Installation Restoration Program (IRP). This RI Report was also written to satisfy the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. This RI Report was prepared by Burns & McDonnell Engineering Company, Inc. (BMcD) under contract DACA41-96-D-8010 with the U.S. Army Corps of Engineers (USACE), Kansas City District (CENWK) and represents Fort Riley's ongoing fulfillment of obligations to investigate and take appropriate actions at sites posing a potential threat to human health and the environment. Included within this RI Report are characterizations of the nature and extent of contamination, an evaluation of the fate and transport of contaminants, and human health and ecological risk assessments (U. S. Environmental Protection Agency [USEPA], 1988).

Since 1990, Fort Riley has conducted several investigations to identify and delineate contamination associated with the 354 Area Solvent Detections and associated impacted areas (hereinafter collectively referred to as the 354 Site). Results from these investigations have indicated that releases of organic compounds have occurred at the 354 Site that may pose a threat to human health and/or the environment.

1.2 SITE BACKGROUND

1.2.1 Site Description

Figure 1-1 depicts the location of Fort Riley, which is located in Geary and Riley Counties, Kansas. The more developed areas of Fort Riley are located in the southern portion of the reservation along the Republican and Kansas Rivers. The developed areas are divided into six cantonment areas: Main Post, Camp Forsyth, Camp Funston, Camp Whitside, Marshall Army Airfield (MAAF), and Custer Hill. The 354 Site is located on Main Post, to the north of the Kansas River, as shown in Figure 1-1.

The 354 Site proper is located within the Directorate of Public Works (DPW) Compound, which is immediately north of the Union Pacific Railroad (UPRR) right-of-way. As this RI progressed, the actual area under investigation was expanded significantly to include areas of Main Post to the north and west of the DPW Compound, as well as the point bar of the Kansas River, located to the south. A detailed overview of the 354 Site is shown in Figure 1-2. The area has a "pie-slice" shape, with a maximum north-south dimension of approximately 5800-feet (ft) and a maximum west-east dimension of approximately 3200-ft. Note that the 354 Site does not extend west of Henry Drive on the point bar. Henry Drive has been designated as an arbitrary boundary between the 354 Site and the Dry Cleaning Facilities Area (DCFA), located to the west.

1.2.2 Site History

The former Building 354 site was constructed in 1935 as a gasoline service station. In addition to gasoline and diesel fuel, it may have been subsequently used as a storage site for solvents and road oil. Two 10,000-gallon steel, underground storage tanks (USTs), one 12,800-gallon steel UST, and one 8,500-gallon steel UST were installed at the site in either 1933 (Dames & Moore, 1995) or 1935 (USACE, 1995), and were used for gasoline and diesel storage. Two 10,000-gallon steel USTs were installed at the site in 1980 and were used for diesel storage (Dames & Moore, 1995). USACE indicated that the USTs at this site were also used to store road oil, and may have been used to store solvents (USACE, 1996). The former USTs (including the solvent tank) were 20 feet south of the former Building 354 and approximately 60 feet northwest of the site (see Figure 1-2). A drawing dated June 1982, obtained from the Fort Riley DPW, indicated plans to replace the pump on a solvent tank located approximately 15 feet southeast of former Building 354. The drawing does not indicate if the tank was a UST or an above-ground tank.

Five of the six USTs, shown on historical drawings of the site, were removed in 1990 and 1991. The 8,500-gallon steel UST, reportedly used for diesel storage, was not found (Dames & Moore, 1995). Fort Riley Real Property records of the DPW Compound indicate that five USTs were located at this site, which corresponds to the number removed in 1990 and 1991.

Building 367 is located on Carr Avenue and was constructed in 1903. The building originally served as a post artillery gun shed and presently serves as a vehicle maintenance shop. The one-story building contains 15,024 square ft and is constructed of limestone on a limestone foundation. Building 367 is on the National Register of Historic Places as a member of the Cavalry and Artillery thematic group within the Main Post Historic District.

The Building 430 is located on Godfrey Avenue and was constructed in 1932. The building was originally built and is still maintained as a fire station. The one-story building contains 4,369 square ft and is constructed of coursed ashlar limestone. Building 430 is on the National Register of Historic Places as a member of the 1927-1940 thematic group within the Main Post Historic District.

1.2.3 Past and Current Land Use

The RI study area encompasses a large amount of area that has historically had a wide variety of land uses. The nature of industrial activities on the post can be directly related to periods of development. Main Post was the first part of the installation developed in the mid-nineteenth century. The post, prior to World War I, evolved from a frontier outpost to a military training post. Limited industrial facilities included a few simple shops, such as blacksmith operations, and storehouses for supplies. Military practice ranges were located near barracks area in the lowlands along the Kansas River valley bluffs.

During World War I, Fort Riley underwent significant expansion in support of the war effort. Much of this expansion took place at locations in the Kansas River alluvial valley, both upstream and downstream from Main Post. More industrial infrastructure was put in place as motor pools and auto repair facilities replaced stables and blacksmith shops. Landfill areas were established on the floodplain to the south of Main Post. The Army airfield became operational in 1921.

Greatly expanded industrial infrastructure was put in place to support Army forces training for World War II. Motor pool activities greatly expanded at Main Post. Additional rail capacity was built along the UPRR, including a petroleum offloading facility and pipeline, and an asphalt batch plant. Following World War II, shops for maintaining tactical equipment were moved to Custer Hill.

Today, that portion of the study area located within Main Post, to the north and west of the UPRR right-of-way, is used for vehicle maintenance and storage, office blocks, warehouses, barracks, and some residential housing units. Much of this area is covered with either concrete or asphalt, and has a high density of buried utilities, including water, sewer, electricity, gas, telephone, and fiber-optic cable. Much of the area to the south and east of the UPRR grade, which is located on the Kansas River floodplain, is in a natural or semi-natural state, with large tracts of deciduous forest. Much of the forest area along the Kansas River is conserved as critical habitat for a transient population of bald eagles. There are some structures in this area, mainly along the UPRR grade, which are used for warehouses and as administrative offices. Underground utilities are present, but not as dense as in the Main Post area.

1.2.4 Regulatory History

Fort Riley was established in 1853 and has been owned and operated by the Department of the Army (DA) since that time. Environmental investigations were performed at Fort Riley during the 1970s and 1980s. These investigations identified activities and facilities where hazardous substances had been released or had the potential to be released to the environment. Potential sources of contamination include landfills; printing, dry cleaning, and furniture shops; and pesticide storage facilities. On July 14, 1989, the USEPA proposed inclusion of Fort Riley on the National Priority List (NPL) pursuant to the CERCLA. USEPA included the site on the NPL, promulgated in August 1990. Fort Riley is identified by USEPA as a Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Site KS6214020756.

Effective June 1991, the DA entered into a Federal Facility Agreement (FFA), Docket No. VII-90-F-0015, with the State of Kansas Department of Health and Environment (KDHE) and USEPA Region VII to address environmental pollution subject to CERCLA, the National Contingency Plan (NCP), and/or the Resource Conservation and Recovery Act (RCRA) (USEPA, 1991). This agreement is also referred to as the Interagency Agreement (IAG). Pursuant to the IAG, Fort Riley conducted an Installation Wide Site Assessment (IWSA) in 1992 [Louis Berger & Associates (LBA), 1992] to identify sites having the potential to release hazardous substances to the environment. The IWSA did not specifically identify the 354 Site as a potential area of concern (PAOC) requiring further evaluation. However, it did address petroleum, oil, and lubricant (POL) facilities (including the 354 Site) as sites which might be evaluated under the UST programs and would normally be excluded from CERCLA since it was not intended to cover sites impacted exclusively by petroleum contamination. However; following the removal of the USTs at the 354 Site, investigation of soil and groundwater revealed the presence of chlorinated solvent contamination. As a result of this, during January 1997 the 354 Area Solvent Detections was formally designated an operational unit (OU). The RI was subsequently initiated.

1.3 REPORT ORGANIZATION

- Section 1.0, Introduction - An introduction of background for the 354 Site and this RI. The other sections included in this report are as follows:
- Section 2.0, Setting – A discussion of surface features, meteorology, hydrology, hydrogeology, geology, land and water use, and ecology at the 354 Site.
- Section 3.0, Previous Investigations – A presentation of results of previous investigations conducted at the 354 Site.
- Section 4.0, Remedial Investigation Field Activities – A presentation of groundwater monitoring, plume characterization, and soil sampling activities.
- Section 5.0, Nature and Extent of Contamination – An assessment of current contamination conditions in all media.

- Section 6.0, Fate and Transport Evaluation – An evaluation of both contaminant transport and contaminant degradation. Also presents the conceptual site model.
- Section 7.0, Human Health Baseline Risk Assessment – A presentation of the human health risk assessment performed using site data.
- Section 8.0, Ecological Evaluation - A presentation of the ecological risk assessment.
- Section 9.0, Conclusions

This RI Report will not cover in detail the results from RI fieldwork conducted in 1999 and early 2000. This fieldwork has been thoroughly described and evaluated in *Data Evaluation Technical Memorandum and Work Plan Addendum, July 1999 – April 2000 Fieldwork for the RI/FS at the 354 Area Solvent Detections (Operable Unit 005) at Main Post, Fort Riley, Kansas* (BMcD, 2001a) [DETMWP]. Brief summaries of this data are presented here to help develop a comprehensive picture of the nature and extent of contamination at the 354 Site, but detailed tables and figures provided in the DETMWP will not be reproduced in this document. A copy of the DETMWP in PDF format on CD-ROM is included with this report. Appendices for this RI Report are also included on CD-ROM.

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2.0 SETTING

2.1 SURFACE FEATURES

Fort Riley and the surrounding area are a part of the Osage Plains section of the Central Lowlands physiographic province, which consists of a plain with low relief that has been eroded by rivers and streams (Schoewe, 1949). Sedimentary bedrock strata dip gently to the west-northwest and east-facing escarpments eroded into more resistant rock units are separated by gentle, westward sloping plains. The resulting topography can be divided into upland areas that are dissected by numerous intermittent and perennial streams, and lowland areas that consist of alluvial plains and associated terraces. The lowland areas occur along the banks of the major rivers in the area: the Republican, Smoky Hill, and Kansas. The topographic relief between the alluvial floodplains and the higher elevations of the upland areas is approximately 250-ft (Jewett, 1941).

A point bar of the Kansas River and an alluvial terrace area dominate the topography across the study area. The point bar lies between the UPRR grade and the Kansas River (Figure 2-1). It is an area of low relief, with ground elevations generally between 1048 and 1063-ft above mean sea level (MSL). The area to the north of the UPRR grade is an alluvial terrace. Because of a complex history of downcutting and alluvial backfilling by the ancestral Kansas River, there is some ambiguity about which alluvial terrace this represents; however, it possibly correlates to the Buck Creek Terrace of the Kansas River (Dort, 1987). The topography on the terrace generally rises to the north. Elevations vary from about 1065-ft above MSL south along the railroad grade, to approximately 1125-ft above MSL at the north portion of the study area in the vicinity of Godfrey Avenue. With the exception of the Kansas River, no perennial creeks or streams are found in the study area. A swale cuts the terrace immediately to the west of the DPW Compound and Building 310. Within the swale, a concrete-lined drainage ditch drains south towards the Kansas River (Figure 2-1). This ditch carries storm-water runoff during times of precipitation. Another masonry-lined drainage ditch is located to the north of the fire station (Building 430) on Godfrey Avenue.

2.2 METEOROLOGY

The average temperature for the area (measured at Station 144972, located at Manhattan, Kansas, approximately 14 miles east-northeast of the 354 Site) is 55 degrees Fahrenheit (°F). Temperature extremes range from a record low of –31 °F (January 1947) to a record high of 116 °F (August 1936). Annual precipitation from 1900 through 2001 ranged from a minimum of 15.42 inches to a maximum of

60.38 inches, with an average of approximately 33 inches per year (inches/yr). The maximum 24-hour rain event during the same period was reported at 6.28 inches. Average annual snowfall is approximately 18 inches, with a maximum annual snowfall during the reporting period of 49.5 inches (in 1960). The maximum 24-hour snowfall event during this same period was reported at 18 inches (High Plains Regional Climate Center, 2002). Pan evaporation, measured by the USACE at Tuttle Creek Lake north of Manhattan, averaged 47.13 inches/yr between 1980 and 1997, with extremes of 37.39 inches/yr and 58.66 inches/yr. Prevailing wind directions are variable. Winds are predominantly from the south and southwest during March through December, with winds predominantly from the north during the months of January and February. Wind speeds generally range from seven to ten miles per hour (personal communication, First Weather Group, Detachment 8, Fort Riley MAAF, 1998).

2.3 GEOLOGY

2.3.1 Regional Geology

The geology of the area consists of outcrops of Permian age sedimentary rock overlain by Quaternary eolian and fluvial deposits. The Nemaha Anticline is the prominent structural feature in the area, and Fort Riley is situated on the western limb of this fold within the Salina Basin. Bedrock in the vicinity of Fort Riley dips gently (about 30-ft per mile – less than one degree) to the west-northwest, and consists of alternating beds of limestone and shale of the Permian Chase and Council Grove Groups (Jewett, 1941). The Barneston Formation of the Chase Group (composed of the Fort Riley Limestone, Oketo Shale, and Florence Limestone Members) is the youngest stratigraphic unit exposed in the upland areas (Figure 2-2). This Permian sequence of interbedded limestone and shale continues to depths of several hundred feet. The bedrock surface has been eroded by the major rivers and streams, which generally flow to the east and south. No significant karst features have been identified on Fort Riley.

2.3.2 Site Specific Geology

Information obtained from soil borings at the study area indicated that the soils sampled were primarily alluvial sediments. The soil borings exhibited the upward-fining sequence typical of alluvial point bar sediments, with coarse-grained sands at depth, grading upward into medium- to fine-grained sands, then fine-grained silts and clays near the surface. The soils in the point bar borings and in those borings advanced in the terrace area, north of the UPRR grade, were found to be generally similar in nature. Most of the materials encountered were natural deposits; however, there was evidence that possible fill material was present in some locations, especially in the area to the west of Building 332 (BMcD, 1998a).

The alluvial and terrace sediments were deposited on top of calcareous shale or limestone bedrock. Bedrock units present at the 354 Site, either as surface outcrops or in the subsurface below the overlying alluvium, are shown in Figure 2-2. Direct-push borings were advanced to refusal, with refusal assumed to occur at the top of bedrock. Bedrock elevations and depths to bedrock across the study area are summarized in Table 2-1. Figure 2-3 presents a bedrock elevation map for data obtained in the study area, including bedrock information collected during the *Initial Field Investigation Report for the Former Building 354 at Main Post, Fort Riley, Kansas* (IFIR) (BMcD, 1998a). Depth to bedrock across the terrace at the RI direct-push boring locations ranged from 7.9-ft below ground surface (bgs) at Direct-Push Boring B47 (northwest of Building 313) to 64.0-ft bgs at Direct-Push Boring B241 (east of Building 367). Bedrock elevations across the study area ranged from 1004.9-ft above MSL at Direct-Push Boring B725 (east of the levee at MAAF) to 1076.4-ft above MSL at Direct-Push Boring B202 (west of Building 301, along Marshall Avenue).

Representative cross sections of the study area are presented in Figures 2-4 through 2-8. Figure 2-4 (cross section A – A') depicts the bedrock surface and surface topography from the area just east of Building 430 south to the Kansas River floodplain. Figures 2-5 through 2-7 (cross sections B – B', C – C', and D – D', respectively) depict the swale and ridge features eroded into the bedrock surface. Figure 2-8 (cross section E – E') shows the bedrock topography across the point bar between the UPRR grade and the Kansas River.

The bedrock surface across the study area consists of a terrace area to the north and a bedrock channel of the ancestral Kansas River to the south. These two areas are separated by an abrupt, south-facing drop-off with about 25- to 30-ft of relief (Figures 2-3 and 2-4). The bedrock surface on the terrace has up to ten-ft of relief locally, and is cut by north-south trending swales and ridges (Figures 2-3, 2-5, 2-6, and 2-7). This bedrock topography is moderately well dissected to the north part of the terrace area, in the vicinity of Carr Avenue. Some areas, such as the bedrock surface below Building 332, are fairly flat. The bedrock surface on the terrace ranges from an elevation of about 1056-ft above MSL to the south (along the UPRR grade), to approximately 1070-ft above MSL to the north (in the vicinity of Godfrey Avenue), and rises to about 1076-ft above MSL to the west (in the vicinity of Marshall Avenue).

To the south, on the point bar, a series of bedrock channels of the ancestral Kansas River are developed. These are oriented roughly sub-parallel to the modern Kansas River channel and have a modest relief of just a few feet (Figure 2-8). Elevations range from about 1006-ft above MSL to the south (along the Kansas River) to approximately 1020-ft above MSL to the north (along the UPRR grade). Repeated changes in base level of the ancestral Kansas River have allowed subaerial erosion to develop a bedrock topography. Within the bedrock channel of the ancestral Kansas River, channels were cut that were oriented sub-parallel to the direction of river flow. On the more extensive terrace area, the bedrock topography was sculptured by tributary streams, which flowed into the ancestral Kansas River at roughly right angles to the direction of river flow. During periods of alluvial aggradation, clastic sediment was deposited within the ancestral Kansas River valley, to include the present terrace area to the north of the railroad grade. The valley was then eroded to its present configuration.

2.4 SURFACE-WATER HYDROLOGY

Fort Riley is located along the Kansas River. The river system in the area includes Milford Lake to the west, the Republican River (which drains from Milford Lake), and the Smoky Hill River to the south. The Republican and Smoky Hill Rivers merge to form the Kansas River approximately two miles west of the 354 Site. There are numerous other intermittent and perennial creeks/streams that dissect Fort Riley, eventually feeding into one of the larger bodies of water identified above. The major streams tend to flow to the east and south. The rivers are broad, shallow, and slow-moving. Stream flow within the Kansas River is heavily regulated by Milford Lake and is typically less than 2,500 cubic ft per second (cfs). During the extraordinary Midwest flood event during the summer of 1993, peak discharge at Fort Riley was approximately 85,000 cfs. Releases from Milford Lake, as well as heavy local rainfall events on the lower drainage basins of the Republican and Smoky Hill Rivers, can result in "flashy" river discharge events, with a rapid rise followed by a less rapid fall in stage.

The Kansas River is located at the southern boundary of the 354 Site. The river is approximately 2,000-ft south of the former Building 354 Site, 3,000-ft south of Building 367, and 3,900-ft south of Building 430. These three areas are separated from the Kansas River by a point bar that is heavily forested and contains numerous natural levees. The point bar lies within the designated 100-year flood plain.

2.5 HYDROGEOLOGY

2.5.1 Regional Hydrogeology

The Fort Riley area lies within the Nonglaciated Central Region Groundwater Province (Heath, 1984). This region is hydrogeologically complex and is generally characterized by both consolidated rock aquifers having low yields and alluvial aquifers along the major rivers. In the vicinity of Geary and Riley Counties, both types of aquifers are present. Consolidated Permian limestone and shale aquifers produce small quantities of groundwater (ten to 100 gallons per minute [gpm]) in the uplands areas. These aquifers are developed within fractures and cavities in the Permian Chase and Council Grove Groups (Buchanan and Buddemeier, 1993). In the river valleys, aquifers are developed within the unconsolidated alluvial sediments deposited by the rivers and major streams. These alluvial aquifers are usually unconfined and water wells completed on the floodplain have high yields in the hundreds of gpm. Elevated alluvial terrace deposits, which are located along the margins and above the modern flood plain, also act as aquifers. These deposits usually have lower transmissivities than the deposits of the modern alluvial floodplain, because the saturated thickness of sediments is much less, and are consequently not a reliable source of supply. However, the terrace aquifers provide recharge to the Kansas River alluvial aquifer and also act as conduits for contaminants. Both alluvial and terrace aquifers are present at the 354 Site.

2.5.2 Site Specific Hydrogeology

Much of the information available on the site specific hydrogeology comes from the network of monitoring wells and piezometers installed at the site over the last ten years. Information on the construction details for these piezometers and monitoring wells is presented in Table 2-2.

The Kansas River alluvial aquifer beneath the study area consists of the sequence described above in Section 2.3.2. The nature of this material is generally the same both in the Kansas River alluvial valley and on the terrace area to the north. The alluvium becomes coarser-grained with depth, and contains some gravel and thin clay layers. The underlying Permian bedrock has a much lower porosity and permeability, although fractures and solution features may provide conduits for groundwater flow. Monitoring wells screened in the bedrock (B354-00-10, B354-01-24, and B354-01-25) all produce water. It is possible that the bedrock is hydraulically connected to the aquifer in the overlying unconsolidated sediments.

Both the Kansas River alluvial aquifer and the thinner terrace aquifer are unconfined aquifers. Within the terrace aquifer, the thickness of the saturated zone is highly variable, ranging from zero (dry) along the southern margin of the terrace (to the north of the UPRR station) to about 16-ft in the vicinity of Building 430 (at Monitoring Wells B354-01-26 and B354-01-28). This water sits directly on the Permian bedrock. On the terrace, the depth to water varies between less than ten-ft bgs (Piezometer PZ-A) to about 55-ft bgs (Monitoring Well B354-01-26). A greater thickness of saturated alluvium is present within the Kansas River alluvial aquifer, which varies between ten and 35-ft. The depth to water under the point bar varies from as little as 12-ft bgs near the Kansas River (Piezometer B354-00-PZ20) to depths of approximately 25-ft bgs in the central portion of the point bar (Piezometer B354-00-PZ17). These figures are based on groundwater conditions as they existed in the spring of 2002.

Sparse information was available concerning the hydraulic conductivity of the terrace aquifer. During the installation of monitoring wells on the terrace in both 1999 and 2001, a total of seven geotechnical samples were collected for off-site laboratory analysis of permeability. These were done using a falling head permeability test (American Society for Testing and Materials [ASTM] D5084). These samples were collected from Monitoring Wells B354-99-08, B354-01-26, B354-01-27, and B354-01-28 from approximately five-ft bgs to 36-ft bgs. Permeabilities ranged from a high of 1200 feet per day (ft/day) for a poorly graded sand at Monitoring Well B354-01-26 (sample depth of five- to seven-ft bgs) to a low of approximately 9.6 X 10^{-4} ft/day, in a sample collected from Monitoring Well B354-99-08 (sample depth of 30- to 32-ft bgs). All values for permeability determined by laboratory methods were reasonable for their respective soil types. Results are presented in Table 2-3.

More information is available on the hydraulic conductivity of the Kansas River alluvial aquifer. Data has been collected during aquifer-pumping tests performed at various areas throughout Fort Riley and along the Kansas River valley. These tests were performed by contractors to both private entities and the USACE for the purpose of constructing water supply wells. An aquifer-pumping test was also performed at MAAF for the purpose of potentially constructing a small groundwater production facility for use during airfield operations. In addition to the aquifer-pumping tests, slug tests were performed on eight monitoring wells installed at the Former Fire Training Area (FFTA-MAAF) RI site at MAAF (*Draft Remedial Investigation Report for the Former Fire Training Area, Marshall Army Airfield at Fort Riley, Kansas*, BMcD, 2001b [FFTA-MAAF RI]). Information collected includes the following:

- Mean value of horizontal hydraulic conductivity for 18 aquifer-pumping tests of the Kansas River alluvial aquifer, from Manhattan, Kansas to Kansas City, Kansas was 680 ft/day. The three aquifer tests nearest Junction City, Kansas reported horizontal hydraulic conductivity values ranging from 740 ft/day to 910 ft/day (Myers et. al., 1996; Fader, 1974).

- A seven-day pumping test was conducted in the Republican River alluvial aquifer by the USACE in 1975. Horizontal hydraulic conductivity ranged from 450 ft/day to 1000 ft/day and averaged 820 ft/day (Myers et. al., 1996; USACE, 1975).

- A 10-hour aquifer test was performed approximately 7,000-ft southwest of the FFTA-MAAF by the USACE in 1983. Horizontal hydraulic conductivity ranged from 600 ft/day to 740 ft/day and averaged 650 ft/day (USACE, 1983).

- Values for horizontal hydraulic conductivity calculated from aquifer-slug tests performed at FFTA-MAAF ranged from 16 ft/day to 30 ft/day (BMcD, 2001b). Differences in the calculated horizontal hydraulic conductivity values between the pumping tests and the slug tests might be explained by the difference in areas of influence measured during each type of test.

Groundwater elevation data were collected at the study area to provide information on groundwater flow direction and magnitude. Water levels have been measured at monitoring wells and peizometers on a periodic basis since the IFI was conducted in the summer and fall of 1997. Water level data is presented in Table 2-4 for the period from October 2000 through July 2002. No accurate measurements of groundwater levels were made during the direct-push fieldwork performed for the RI; however, this work provided qualitative information on the configuration of the unconfined aquifers, both under the terrace area and the Kansas River floodplain. In general, the water table conforms to the slope of the bedrock and ground surface, with groundwater flowing to the south, off the terrace area and onto the Kansas River floodplain.

Groundwater levels were measured monthly from July 2001 through July 2002 at 54 monitoring wells and piezometers (Table 2-4). Potentiometric surface maps are provided for the months of September 2001, and January, April, and July 2002 (Figures 2-9 through 2-12, respectively). A hydrograph for the Kansas River stage during the period July 2001 through August 2002, as measured at the United States Geological Survey (USGS) gauging station at the Henry Drive bridge, is included as Figure 2-13. This figure also includes water levels for Monitoring Wells B354-00-PZ14 and MPL94-01, which are both equipped with data collection platforms (DCPs) by the USGS. No attempt has been made to plot groundwater level data with respect to the depth of the screened intervals for those monitoring wells and piezometers completed within the Kansas River alluvial aquifer. Significant equipotential differences between the screened intervals are not apparent at Monitoring Well/Piezometer clusters B354-99-12/12b/12c, B354-99-11/11c, B354-00-PZ14/PZ14c, B354-00-PZ19/01-19c, B354-00-PZ20/01-20c, or B354-01-31/31c.

Groundwater flow within the terrace aquifer is generally to the south, towards the Kansas River alluvial aquifer. Groundwater gradients within the terrace aquifer range from about 0.006 feet per foot (ft/ft) to about 0.015 ft/ft. Groundwater flow within the Kansas River alluvial aquifer is controlled by the Kansas River and generally conforms to the direction of river flow. Groundwater flow across the point bar is generally to the east, with gradients ranging from approximately 0.0005 to 0.0008 ft/ft. An evaluation of Kansas River stage elevations measured at Fort Riley since 1964, when the gauging station was installed, suggest that hydraulic connectivity between the river and the terrace aquifer exists only during the highest flood stages. For example, during the 1993 flooding on the Kansas River, the river surface elevation peaked at 1062.62-ft above MSL. This elevation was about six-ft above the bedrock surface which defines the base of the terrace aquifer, thus the possibility existed that the river might have provided recharge to the terrace aquifer during this period (losing stream condition). However, this condition would exist only during exceptional flood events. Usually, the Kansas River remains within its channel and groundwater moves from the terrace aquifer south into the Kansas River alluvial aquifer.

An evaluation of the Kansas River stage and water levels in selected monitoring wells (as presented in Figure 2-13) suggests that the river and the Kansas River alluvial aquifer on the point bar behave as an integrated system. Monitoring Well B354-00-PZ14, which is located immediately adjacent to the river, responds quickly to changes in river stage. Monitoring Well MPL94-01, which is approximately 1,200-ft from the river, also responds to changes in river stage, but the response is dampened out.

2.6 SOILS

Eudora and Kenesaw soils are developed at the study area (Jantz et al., 1975). Eudora silt loams are well drained, have a moderate permeability, and normally form in coarse, silty alluvium on high flood plains or low terraces. Eudora soils are present in the alluvial valley to the south and east of the UPRR grade. Kenesaw silt loams form on loess on sloping upland and terrace areas. Kenesaw soils are present on the Buck Creek terrace deposits north of the UPRR grade. These soils are also well drained and moderately permeable.

2.7 DEMOGRAPHY

Fort Riley's manpower strength was approximately 10,500 military personnel as of September 1, 2002. In addition, 3,995 Department of Defense (DoD) civilians were employed on the post and 7,864 military family members (dependents) were housed on Fort Riley (Personal Communication, Fort Riley Public Affairs Office, 2002). The majority of personnel at Fort Riley are housed on the Custer Hill cantonment area.

In addition to the other cantonment areas of Fort Riley (all of which are within four miles of the 354 Site), the following towns are within four miles of the 354 Site: Junction City (adjacent to the south of the post, including Grandview Plaza) and Ogden (adjacent to the east of the post). The approximate populations of the surrounding towns according to the 2000 census are: Junction City (18,886), Grandview Plaza (1,184), and Ogden (1,762) (United States Department of Commerce [USDoC], 2000).

Junction City is in Geary County and Ogden is in Riley County. According to the 2000 census data, there is an average of 2.69 persons per residence in Riley County, which has a population of 62,843 persons, and 2.34 persons per residence in Geary County, which has a population of 27,947 persons.

2.8 LAND AND WATER USE

2.8.1 Land Use

The 354 Site is part of the Fort Riley reservation and is not zoned by Geary County. North and west of the UPRR grade is a built-up area (Main Post), with building and road development. Buildings include offices, barracks, family housing units, warehouses, and maintenance facilities. South and east of the UPRR grade is the point bar of the Kansas River. This area is mainly covered with forest and vegetation; although, there is one built-up area between the UPRR grade and Marshall Avenue. The built-up area consists of warehouses, several of which have been converted to office buildings.

Land use at the 354 Site is classified under the Fort Riley master plan. Figure 2-14 provides an overview of land use within the study area. It is anticipated that land use activities will remain unchanged into the foreseeable future. The Main Post area to the north of the UPRR grade is classified as a national historical area. The area to the south of the UPRR grade should not see significant changes in current land use. This is because it is within the active flood plain of the Kansas River and the area within 100 meters of the current Kansas River bank is critical wildlife habitat for bald eagles that winter over at Fort Riley.

2.8.2 Water Use

Groundwater is the primary source of drinking water for Fort Riley and many of the surrounding communities. Alluvial sand and gravel deposits in the Kansas and Republican River valleys are excellent aquifers. Potential users of the Kansas River are identified in this section.

2.8.2.1 Kansas River Alluvial Aquifer

Fort Riley, Morris County Rural Water District, and the communities of Junction City and Ogden rely on groundwater withdrawn from alluvial materials for their drinking water supplies. Fort Riley has eight active wells, Junction City has nine active wells, Ogden has three active wells (United States Army Environmental Hygiene Agency [USAEHA], 1992 and LBA, 1995), and Morris County Rural Water District has three active wells. The Fort Riley well field is not currently operating at full capacity. Ogden also provides water to a rural water district in Riley County. The wells for Ogden and Junction City are more than four miles from the site and the Morris County Rural Water District wells withdraw water from the Clarks Creek alluvium which are hydraulically separated from the Kansas River alluvium.

The Fort Riley water supply wells are located approximately four miles upgradient (west) of the 354 Site near Camp Forsyth. The nearest water supply well (used as a backup well) is in Building 801 at MAAF, within one mile of the 354 Site. This well is east of the airfield and south (upgradient) of the site. The purpose for the well at Building 801 is to service the airfield in the event of an emergency affecting the Fort Riley water distribution system.

2.8.2.2 Terrace Aquifer

At the 354 Site, there are no known water supply wells completed in the terrace aquifer. The transmissivity of the terrace aquifer is quite low. This is due to the limited saturated thickness, which is generally no greater than ten ft, and usually less than this. Because of the prolific supply available from the Kansas River alluvial aquifer, there is no reason that water supply wells would ever need to be completed in the terrace aquifer.

2.9 ECOLOGY

Fort Riley lies within a transition zone between deciduous forests of eastern Kansas and the grass prairies of the Great Plains. Historically, the region would have consisted of tall grass prairies and bottomland forests along the Kansas River. Euro-American settlement of the region resulted in the conversion of natural habitats to agricultural fields and pastureland. Currently, Fort Riley consists of a mosaic of upland and riparian woodland habitats, tall grass prairie, cropland, pastures, hayfields, parkland, and areas of urbanized development. The preliminary field survey conducted by BMcD biologists indicated that the 354 Site, which is located at the southern end of the base, is divided by the UPRR corridor. The area north of the UPRR corridor consists of parkland and urbanized development and the area south of the UPRR corridor, the point bar portion of the 354 Site, consists of riparian forests habitat (Figure 2-15).

The majority of the area north of the UPRR corridor consists of base buildings, parking lots, roads, storage areas, and parkland shaded by large mature landscape tree species. The ground cover consists of typical lawn species such as fescue (*Festuca* sp.), buffalo grass (*Buchloe dactyloides*), sweet clover (*Melilotus* sp.), wood sorrel (*Oxalis* sp.), dandelion (*Taraxacum officinale*), and bindweed (*Convolvulus* sp.). Wildlife expected to be present includes those species typically found in urbanized areas. Species likely to inhabit the area north of the UPRR corridor include the red fox (*Vulpes vulpes*), opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), squirrels (*Sciurus* sp.), eastern cottontail rabbit (*Sylvilagus floridanus*), ground squirrels (*Spermophilus* sp.), garter snakes (*Thamnophis* sp.), toads (*Bufo* sp.), American crow (*Corvus brachyrhynchos*), mourning dove (*Zenaida macroura*), and various species of mice and songbirds.

The dominant plant species found in the point bar portion of the 354 Site include eastern cottonwood (*Populus deltoides*) and honey locust (*Gleditsia triacanthos*). Other species of vegetation within this area include reed canary grass (*Phalaris arundinacea*), wild grape (*Vitis* sp.), Virginia creeper

(*Parthenocissus guinquefolia*), poison ivy (*Toxicodendron radicans*), sunflower (*Helianthus annuus*), mullein (*Verbascum thapsus*), horsetails (*Equisetum* sp.), prairie rose (*Rosa setigera*), foxtail (*Setaria* sp.), sedges (*Carex* sp.), willow (*Salix* sp.), and sycamore saplings (*Platanus occidentalis*). Evidence for species within the point bar portion of the 354 Site included the tracks of deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), great blue heron (*Ardea herodias*), and various small shore birds. The shells from predated pink paper shell mussels (*Potamilus ohiensis*), Asian clam (*Corbicula fluminea*), and maple leaf mussels (*Quadrula quadrula*) were found along the sandy banks of the Kansas River. Additionally, shiners (*Notropis* sp.) were observed feeding along the shore of the Kansas River and three pink paper shell mussels were observed filter feeding in a backwater pool of the Kansas River directly below Monitoring Wells B354-01-20c and B354-00-PZ20. Other wildlife likely to inhabit this area include coyote (*Canis latrans*), red fox, eastern cottontail rabbit, squirrels, and various species of mice, voles, snakes, frogs, toads, and song birds.

The majority of the 354 Site is upland in nature. The Kansas River, which is a perennial watercourse, forms the southern boundary of the site. Two small concrete and limestone-lined drainage ditches carry runoff from the Main Post through the point bar area. These two ditches meet, form a channel approximately ten-ft deep and 20-ft wide, and empty into the Kansas River. According to the National Wetland Inventory (NWI) maps, five palustrine scrub-shrub wetlands classified as PSSA and five riverine wetlands classified as R2USA or R2USC that are seasonally or temporarily flooded are located on the north bank of the Kansas River. No other streams or wetlands were shown on the NWI map for the Site.

A review was conducted to ascertain the status of threatened or endangered species and their habitats in the vicinity of the 354 Site. Table 2-5 includes listed and rare species occurring or potentially occurring that have been identified in the Fort Riley area by the Fort Riley Conservation Division. These species are state or federally protected, state species in need of conservation, or are uncommon or rarely observed in the area.

Many of the species listed in Table 2-5 have recently been documented at Fort Riley. However, their presence in contaminated areas of the 354 Site is not likely due to the amount of base activity and human disturbance within the area. The Kansas River, along the southern edge of the 354 Site, is a known winter roosting habitat for migratory bald eagles. None of the listed species were observed in the vicinity of the 354 Site during field site visits in 1998 and 2002. The future presence of any of these species in the contaminated areas at the 354 Site is likely to be transitory.

* * * * * *

3.0 PREVIOUS INVESTIGATIONS

This section will summarize field activities and investigations which took place prior to initiation of the RI fieldwork. These activities include the IWSA, the Preliminary Site Assessment (PSA), the Phase II investigation, various additional site assessment activities, and the IFI. Table 3-1 provides a chronology of fieldwork, including all RI field activities.

All data presented in this section was described in detail in previous reports; therefore, tables and figures will be kept to a minimum. Several figures will be presented to summarize the results of the IFI; otherwise, tables and figures from previous reporting will be referenced where necessary. A summary of data from the PSA, the Phase II investigation and additional site assessment activities is included in *Remedial Investigation/Feasibility Study Work Plan for the Former Building 354 Solvent Detection Site at Main Post, Fort Riley, Kansas* (BMcD, 1999a) [Remedial Investigation/Feasibility Study (RI/FS) Work Plan (WP)]. The results are discussed in the IFIR (BMcD, 1998a).

3.1 INSTALLATION WIDE SITE ASSESSMENT

Fort Riley conducted the IWSA in 1992 (LBA, 1992) to identify sites having the potential to release hazardous substances to the environment. The IWSA identified the 354 Site as one of the sites where releases of hazardous substances to the environment either have occurred or were likely to have occurred. Subsequent to the IWSA, site investigations were planned for three groupings of sites. A SI for the first group, the Sensitive-Receptor Lead Sites, was initiated in June 1993. The Sensitive-Receptor Lead Sites were later incorporated into a second group, the High Priority Sites. The *Site Investigation Report for High Priority Sites at Fort Riley* (LBA, 1994) was initiated in September 1993. The remaining sites, known as "Other Sites," identified in the IWSA as requiring further investigation, were included in the SI initiated in March 1994 (LBA, 1995a).

3.2 PRELIMINARY SITE ASSESSMENT

The PSA was conducted between December 1992 and September 1994 by Dames and Moore (Dames & Moore, 1995). Activities included:

- Soil-gas survey
- Monitoring well installation
- Groundwater sampling

In December 1992, a 28-point soil-gas survey was conducted in the area to the south and east of the former Building 354 in order to assess the horizontal extent of petroleum contaminated soil (see Figure 2-9 in the RI/FS WP). Soil-gas samples were analyzed on site with a gas chromatograph (GC) for benzene, toluene, ethylbenzene, and total xylenes (BTEX); 1,2-dichloroethane (1,2-DCA); and total volatile petroleum hydrocarbons (TVPH). Two monitoring wells (TS0292-01 and TS0292-02) were installed in December 1992 at locations selected based on the soil-gas sampling results (see Figure 2-9 in the RI/FS WP). The data available concerning the time of well development are contradictory and suggest that these wells were sampled for the first time in November 1993.

Water levels and free-product thickness were measured 35 times between November 1993 and September 1994 in Monitoring Well TS0292-01. Free product was encountered on two occasions and both times was measured as 0.01-ft. This was the smallest thickness measurable with the available interface probe (Dames & Moore, 1995).

Groundwater sampling was conducted as part of the PSA during both November 1993 and September 1994. Monitoring Wells TS0292-01 and TS0292-02 were sampled for volatile organic compounds (VOCs) and lead (see Table A-5 in the RI/FS WP).

3.3 PHASE II SITE INVESTIGATION

A Phase II site investigation was conducted by Dames & Moore between September 1994 and March 1995 and summarized in the *Building 354 Site Investigation: POL UST Investigations/Remedial Action Plans, Fort Riley, Kansas* (354 SI) (Dames & Moore, 1995). Activities included:

- Soil borings
- Monitoring well and piezometer installation
- Direct-push groundwater sampling with on-site analysis
- Groundwater sampling of monitoring wells (with off-site analysis)

Between October and December 1994, ten soil borings (354SB-01 through 354SB-10) were advanced and sampled to confirm the findings of the soil-gas survey (see Figure 2-10 in the RI/FS WP). Soil sample headspace was screened for VOCs with a photoionization detector (PID). Soil samples were tested in the field for total petroleum hydrocarbon (TPH) by immunoassay. Two duplicate samples were collected and submitted for laboratory analyses for comparison of TPH values. An additional four soil borings (354SB-11 through 354SB-14) were advanced in February 1995 (see Figure 2-10 in the RI/FS WP). Soil samples were submitted for off-site laboratory analyses of VOCs, semivolatile organic compounds (SVOCs), and TPH to confirm the headspace and immunoassay analyses.

In September 1994, Piezometers PZ-A and PZ-B were installed at the 354 Site. Piezometer PZ-A was sampled and analyzed for BTEX with an on-site GC, but Piezometer PZ-B was dry. Piezometers PZ-C and PZ-D were installed and sampled in January 1995 (see Figure 2-11 in the RI/FS WP). In addition, five groundwater samples were collected using direct-push equipment in January 1995. An attempt was made using direct-push equipment to collect groundwater samples at nine other locations, but these yielded no water. All of these samples were analyzed with an on-site GC for BTEX, 1,2-DCA, total volatile organic compounds (TVOCs), 1,1-dichloroethene (1,1-DCE), 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE), and tetrachloroethene (PCE).

In February 1995, three new monitoring wells (MW95-03, MW95-04, and MW95-05) were installed by Dames & Moore at the site (see Figure 2-11 in the RI/FS WP). Monitoring Well MW95-05 was damaged during development and was replaced with Monitoring Well MW95-06. These three monitoring wells, along with Monitoring Wells TS0292-01 and TS0292-02, were sampled and analyzed at an off-site laboratory for VOCs, lead, and TPH-Diesel Range Organics (TPH-DRO) in March 1995.

3.4 ADDITIONAL SITE ASSESSMENT ACTIVITIES

Additional site assessment activities were conducted by LBA in December 1995. Results are summarized in *Data Summary Report for Confirmation Groundwater Sampling: Building 354 Solvent Detection Area (Main Post Landfill, Pesticide Storage Facility, and Main Post Solvent Detection Site), Fort Riley, Kansas* (LBA, 1996). This consisted of both groundwater sampling and water level measurements. Monitoring wells were sampled for VOCs, TPH-Gasoline Range Organics (TPH-GRO), TPH-DRO, metals, and nitrate (see Tables A-5, A-6, and A-7 in the RI/FS WP).

3.5 INITIAL FIELD INVESTIGATION

BMcD conducted field activities between August and September 1997 as part of the IFI. The results of the IFI are reported in the IFIR (BMcD, 1998a). The objectives of the IFI were to define the groundwater gradient at the 354 Site and to attempt to determine the source, nature, and extent of chlorinated solvent contamination. IFI field activities included:

- Installation of six temporary piezometers
- Completion of a soil-gas survey at 71 locations with on-site GC analysis

- The collection of 16 subsurface soil samples at 14 locations for on-site GC analysis
- Installation of 12 direct-push temporary monitoring wells
- The collection of groundwater screening samples for on-site GC analysis
- The collection of groundwater samples from 12 existing monitoring wells and piezometers for off-site chemical analysis

The off-site analytical data (groundwater samples) from the IFI was suspect due to complications within the laboratory that performed the analyses (Intertek Testing Services). These analytical results will be described, but this data was not used in the risk assessment.

3.5.1 Temporary Piezometer Installation

Six temporary piezometers were installed at the IFI study area during August 1997 (see Figure 1-3 in the IFIR). Temporary piezometers were installed using truck- and van-mounted direct-push sampling equipment. The direct-push borings were continuously sampled using a Macro-Core (four-ft by two-inch) sampler and were advanced to refusal. It should be noted that all direct-push borings advanced to refusal are presumed to have reached bedrock. Direct-push boring logs are included in Appendix A of the IFIR (BMcD, 1998a).

The sampling procedure produced a nominal two-inch boring in which the temporary piezometer was installed. A one-inch schedule 40 polyvinyl chloride (PVC) riser pipe with a five-ft section of machine slotted screen (0.01-inch slot) was installed in each direct-push boring. These temporary piezometers were screened in natural sand and granular bentonite was placed in the annulus as a surface seal. Completions were either as stick-up or flush, depending on the location.

All temporary piezometers were surveyed. Water level measurements were taken intermittently during the IFI field phase. Upon completion of the investigation in September 1997, BMcD abandoned the temporary piezometers in accordance with the Site Wide SAP (BMcD, 1998c). They were abandoned by pulling the PVC screen and riser, and backfilling the boring with granular bentonite.

3.5.2 Soil-Gas Survey

Soil-gas samples were collected from 71 locations from the unsaturated interval just above bedrock or groundwater (see Figure 1-3 in the IFIR). The survey was conducted in August 1997, using truck- or van-mounted direct-push sampling equipment. One groundwater sample was also collected from Direct-Push Boring B-62 and analyzed. Direct-push borings were advanced to refusal based on results of the temporary piezometer installations. Each soil-gas sample, and the one groundwater sample, were analyzed for PCE, TCE, 1,2-DCA, and benzene using an on-site GC. Each direct-push boring was abandoned by backfilling with granular bentonite.

A 62-point sampling grid was designed, using ELIPGRID PC software. This software was used as a guide to soil-gas sampling and to provide a known level of confidence in determining the source or sources within the grid. The initial soil-gas samples were collected near known areas of contamination near the former UST pit. Subsequent sample locations were selected by successively stepping out one grid node point in an attempt to determine the extent of contamination. Results of the soil-gas survey indicated that the area covered by the proposed grid was not adequate to determine sources or the extent of the chlorinated solvent contamination. In addition, several points within the initial 62-point sampling grid were not required. As the investigation progressed, the grid was expanded to include 27 additional points located 150- to 250-ft outside of the initial grid. Following completion of the soil-gas survey, all direct-push boring locations were surveyed.

3.5.3 Temporary Monitoring Well Installation and Sampling

Temporary monitoring well locations were selected based on soil-gas survey results and groundwater flow direction at the IFI study area (see Figure 1-3 in the IFIR). The locations were selected to obtain soil and groundwater analytical results that would satisfy one or more of the following objectives:

- Characterize contamination within the plume
- Define extent of the plume
- Identify possible sources

During September 1997, 16 soil samples were collected from 14 direct-push borings for on-site GC analyses of PCE, TCE, 1,2-DCA, and benzene. Soil samples for analyses were selected based on the results of field screening of soil samples with a PID. Soil samples with the highest PID reading were selected for on-site GC analyses. The direct-push borings were continuously sampled using a Macro-Core (four-ft by two-inch) sampler. Direct-push borings were advanced to refusal. Two confirmation samples were submitted for off-site laboratory analysis of VOCs, SVOCs, and target analyte list (TAL) metals.

Twelve of the 14 direct-push borings were completed as temporary monitoring wells. The sampling procedure produced a nominal two-inch boring in which each temporary monitoring well was installed. A one-inch schedule 40 PVC riser pipe with a five-foot section of machine slotted screen (0.01-inch slots) was installed in each direct-push boring. The temporary monitoring wells were screened in natural sand and granular bentonite was placed in the annulus as a surface seal.

During late September 1997, groundwater screening samples were collected from nine temporary monitoring wells, five temporary piezometers, and four existing piezometers. The wells and piezometers were not purged before sampling. The decision not to purge was based on these being screening samples, which were to be analyzed in the field. In addition, the wells and piezometers were very slow to recharge and it was thought that they would not provide adequate water for purging. Each groundwater screening sample was collected using a disposable polyethylene mini-bailer and analyzed within 30 minutes of collection with a portable on-site GC. Eighteen groundwater samples and one duplicate were analyzed on-site for benzene, 1,2-DCA, PCE, and TCE. Two groundwater samples were collected and submitted to the off-site laboratory for confirmation analyses of VOCs and SVOCs. Samples could not be collected from six sample points because groundwater was not present. However, two of these sample points did have groundwater present following heavy rain. Following groundwater collection, samples were packed on ice and transported to the direct-push contractor's office for GC analyses within four hours.

All temporary monitoring wells were surveyed. Water level measurements were taken intermittently during the IFI field phase. Upon completion of the investigation in September 1997, BMcD abandoned the temporary monitoring wells in accordance with the Fort Riley SAP. They were abandoned by pulling the PVC screen and riser, and backfilling the boring with granular bentonite.

3.5.4 Existing Monitoring Well Sampling

Groundwater samples were collected from 12 existing monitoring wells near the former Building 354 Site, the Pesticide Storage Facility (PSF), and the Main Post Landfill during mid September 1997. The monitoring wells sampled included MW95-03, MW95-04, MW95-05, TS0292-01, TS0292-02, MPL92-03, MPL92-04, MPL92-05, PSF92-02, PSF92-03, PSF92-04, and PSF92-05 (see Figure 3-13 in the IFIR). The groundwater samples were analyzed at an off-site laboratory for VOCs, SVOCs, and TAL metals. Before sampling, the monitoring wells were purged using either dedicated or non-dedicated bladder pumps until pH, specific conductance, and temperature stabilized and turbidity was less than 30 nephelometric turbidity units (NTUs).

One quality assurance (QA) sample was submitted to the USACE Chemistry and Materials Quality Assurance Laboratory. One quality control (QC) sample and a matrix spike/matrix spike duplicate (MS/MSD) were submitted to the off-site analytical laboratory for analyses. Two equipment blanks were collected on the non-dedicated bladder pump.

3.6 PREVIOUS INVESTIGATION RESULTS

3.6.1 Soil-Gas and Soil Results

During the December 1992 soil-gas survey conducted as part of the PSA, BTEX, and TPH were detected in two of the soil-gas samples (see both Figure 2-9 and Table A-2 in the RI/FS WP). These samples were collected approximately ten and 90-ft east of the former locations of the USTs. 1,2-DCA was also detected in the sample collected approximately 90-ft east of the UST locations. Visibly contaminated soil was observed on the direct-push rods at a sample location near the base of the slope, approximately 140-ft southeast of the former tank pit, but the results for the soil-gas sample were below detection limits (Dames & Moore, 1995).

VOCs and TPH were detected in various soil samples collected when the initial ten soil borings for the Phase II investigation were advanced between October and December 1994. Additional soil borings were advanced in February 1995. Ethylbenzene, total xylenes, and TPH were detected in samples collected from Soil Boring 354SB-12, which was located in the immediate area of the former UST locations (see both Figure 2-10 and Table A-3 in the RI/FS WP).

The soil-gas survey conducted during the IFI indicated the presence of TCE and PCE in an area illustrated on Figure 3-1 (see also Table 3-3 in the IFIR). The highest soil-gas results for PCE and TCE were detected at Direct-Push Borings B-11 (76.8 micrograms per Liter (μg/L) PCE and 3.2 μg/L TCE) and B-21 (73.9 μg/L PCE and 4.2 μg/L TCE). On-site analyses detected PCE in soil samples collected during the installation of Temporary Monitoring Wells T-01, T-05, T-09, T-12, and T-15. In addition, TCE was detected in soil samples collected from Temporary Monitoring Wells T-05 and T-09. PCE and TCE concentrations in soil are presented on Figure 3-2 (see also Table 3-4 in the IFIR).

The extent of PCE soil-gas detections near former Building 354 appeared to be partially defined by the IFI fieldwork. There were insufficient data to determine the extent in areas north of Direct-Push Borings B-74 and B-86, north of Building 300, and south of Direct-Push Boring B-83. TCE detections in groundwater appear in small isolated areas within the larger area of PCE detections. At the time the IFI data were evaluated, the probable source for the PCE and TCE contamination encountered was thought to be the solvent storage tank located near former Building 354, waste management activities near Building 332, and unknown sources north of Buildings 300 and 330.

The results of the soil-gas survey indicated the presence of benzene and 1,2-DCA in an area approximately 100-ft by 150-ft near the former Building 354 (see Figure 3-1). The highest soil-gas results for benzene and 1,2-DCA were detected at Direct-Push Boring B-36a (203 μg/L and 78.2 μg/L, respectively), immediately downgradient of the former UST facility at former Building 354. Results of the on-site soil-sample analyses confirmed the presence of contamination in an area similar to the area defined by soil-gas results. At Temporary Monitoring Well T-05, benzene was detected in the on-site soil sample at 2,899 microgram per kilogram (µg/kg); however, benzene was not detected in the off-site laboratory analyses of this sample (see Table 3-4 in the IFIR). On-site analyses of soil samples collected during the installation of temporary monitoring wells showed the presence of 1,2-DCA. However, confirmation soil samples submitted for off-site analyses did not detect 1,2-DCA above the detection limits. Results of the analyses of all soil-gas and soil samples indicated the presence of benzene and 1,2-DCA in an area approximately 100-ft by 150-ft near former Building 354.

3.6.2 Groundwater Results

Direct-push groundwater screening samples were collected by Dames & Moore as part of the Phase II investigation in January 1995 (see Table A-4 in the RI/FS WP). PCE and TCE were detected in some of these samples collected south and east of former Building 354; however, all detections were below USEPA maximum contaminant levels (MCLs). BTEX compounds were also detected in some of the samples. Groundwater samples were collected from Monitoring Wells TS0292-01 and TS0292-02 in September 1994 and submitted to an off-site laboratory for analyses of VOCs and TPH. At that time, PCE was detected in Monitoring Well TS0292-01. In March 1995, PCE was detected in three monitoring wells: TS0292-01, MW95-04, and MW95-06 (Dames & Moore, 1995).

In December 1995, water levels were measured and samples were collected from five former Building 354 monitoring wells, three Main Post Landfill monitoring wells, and five PSF monitoring wells (see Tables A-5, A-6, and A-7 in the RI/FS WP). The results of the water level measurements and groundwater sampling from all three areas are summarized in the confirmation groundwater sampling data summary report (DSR) (LBA, 1996). This report listed the results of each round of sampling from these monitoring wells. PCE was not detected in any of the Main Post Landfill monitoring wells, but the degradation products TCE and 1,2-DCA (possibly fuel related) were detected at levels below the MCL. TCE was detected in one PSF monitoring well, PSF92-05, at a concentration below the MCL in July 1992, but has not been detected in any subsequent sampling events. No other chlorinated solvents were reported as detected in the PSF monitoring wells. PCE was detected in three monitoring wells at the IFI study area; TS0292-01, MW95-04, and MW95-06 (LBA, 1996).

During the Phase II site investigation conducted between September 1994 and March 1995, chlorinated solvents, particularly PCE, were detected in groundwater both upgradient and downgradient of the 354

Site (USACE, 1996). Results of the groundwater sampling, conducted in December 1995, indicated that PCE concentrations had decreased compared to the previous two sampling rounds.

On-site groundwater analyses conducted as part of the groundwater screening during the IFI detected PCE and TCE above the USEPA MCL (both 5.0 µg/L) in the areas identified on Figures 3-3 and 3-4 (see also Table 3-5 in the IFIR). The highest concentrations were detected at Temporary Piezometer P-03 (200 µg/L PCE and 7.9 µg/L TCE). This temporary piezometer is near Direct-Push Borings B-11 and B-21, where the highest levels of PCE and TCE were detected during the soil-gas survey (Direct-Push Borings B-11 and B-21 are located approximately 100-ft east and southeast, respectively, of Temporary Piezometer P-03).

Off-site laboratory analyses were conducted on groundwater samples collected from Temporary Piezometer P-03 and Temporary Monitoring Well T-21 (see Table 3-7 in the IFIR). Results showed PCE at a similar, but lower concentration of 172 µg/L (on-site analytical result for PCE was 200 µg/L). cis-1,2-DCE, a common degradation product of PCE and TCE, was detected below the USEPA MCL (70 µg/L) in the sample from Temporary Monitoring Well T-21. On-site analyses also indicated PCE above the USEPA MCL in Piezometers PZ-C and PZ-D. In addition, TCE was detected at Temporary Monitoring Well T-08; however, the detection was below the USEPA MCL (see Table 3-5 in the IFIR).

As a result of the IFI fieldwork, the extent of PCE groundwater contamination near former Building 354 appeared to be partially defined (Figure 3-3). There were insufficient data to determine the extent of PCE in the areas north of Buildings 300 and 330, and south of Temporary Piezometer P-05. TCE detections in groundwater appear in small isolated areas within the more extensive area of PCE contamination (Figure 3-4). The extent of TCE and PCE detections in groundwater covered an area similar to the extent of the soil-gas detections. Based on information collected during the IFI, probable sources for the PCE and TCE contamination were the solvent storage tank located near former Building 354, waste management activities near Building 332, and unknown sources north of Buildings 310 and 330. The southeastern extent of PCE detections in excess of 5.0 µg/L was somewhat defined. Results of on-site analyses of groundwater also indicated the presence of PCE at levels above the USEPA MCL at Piezometers PZ-C and PZ-D.

Results of on-site analyses of groundwater indicated the presence of benzene above the USEPA MCL of 5.0 µg/L in the area immediately downgradient of the UST facility at former Building 354 (see Figure 3-5). Benzene was detected in five of the 18 samples. The highest concentration of benzene in groundwater was detected at Direct-Push Boring B-62 (135 µg/L). Benzene was not detected in the two confirmation samples collected for off-site analyses. Results of the off-site laboratory analyses showed 25.1 µg/L benzene in a groundwater sample collected from existing Monitoring Well TS0292-02. Benzene was not detected in any other monitoring well.

On-site analyses of groundwater also indicated the presence of 1,2-DCA above its MCL of 5.0 µg/L in the areas indicated on Figure 3-5. 1,2-DCA was detected in all of the 18 groundwater samples analyzed onsite. Concentrations of 1,2-DCA were less than 5.0 µg/L in nine of the 18 samples. 1,2-DCA was not detected above the detection limit of 5.0 µg/L in the two confirmation samples collected and analyzed by the off-site laboratory. In addition, 1,2-DCA was not detected in the off-site laboratory analyses of groundwater samples collected from three monitoring wells (TS0292-01, TS0292-02, and MW95-06) located within the extent of the on-site detections of 1,2-DCA.

Results of the groundwater analyses indicated the presence of benzene at and immediately downgradient of the location of the UST facility at former Building 354 (see Figure 3-5). 1,2-DCA was more widespread, with the highest concentrations present along the UPRR grade. The probable source for this contamination was the former UST facility at former Building 354. A former rail tank car unloading facility, which had been located at the northeast corner of Marshall Avenue and the UPRR, was identified as another possible source.

* * * * * *

4.0 REMEDIAL INVESTIGATION FIELD ACTIVITIES

In late 1998, the decision was made to conduct a full RI/FS at the 354 Area Solvent Detections Site. The overall investigation approach was described in the RI/FS WP (BMcD, 1999a). Specific field procedures were described in *Site Specific Sampling and Analysis Plan for the RI/FS at Former Building 354 Solvent Detection Site, Main Post, Fort Riley, Kansas* (BMcD, 1999c) [SSAP]. Following the initial period of RI/FS fieldwork completed between July 1999 and April 2000, all data collected were evaluated in order to provide an updated overview of site conditions and to propose additional fieldwork required to fill data gaps. This evaluation was presented in the DETMWP (BMcD, 2001a). Section 7.0 of the DETMWP served as the SAP for the final phase of RI fieldwork, conducted between May and November 2001.

The size of the 354 Site expanded significantly as the 1999 and 2000 fieldwork progressed. Additional direct-push borings for both groundwater screening and soil gas were added on an ad hoc basis, in an effort to delineate the area impacted by contamination. These were added as the field work progressed and were not documented within a formally reviewed SAP prior to field execution. Informal documentation discussing expansion of the sampling grids and/or methods used were included as Appendix A of the DETMWP (BMcD, 2001a).

This section will provide an overview of all RI field activities. Those RI field activities which have been previously discussed elsewhere (1999 and 2000 fieldwork) will be briefly reviewed. More recent activities (2001 field season) will be covered in greater detail. Table 3-1 provides a chronology of all fieldwork, including the RI fieldwork, completed by BMcD at the 354 Site.

The following RI field activities were completed by BMcD between July 1999 and April 2000:

- Collection of 328 groundwater-screening samples at 180 locations
- Collection of 70 soil-screening samples at 20 locations
- Collection of 110 soil-gas samples at 57 locations
- Off-site laboratory analysis of selected confirmation samples (soil and groundwater)
- Installation of 11 monitoring wells and 11 piezometers
- Surveying of direct-push sampling locations, monitoring wells, and piezometers
- Interim groundwater sampling events
- Surface water sampling of the Kansas River

These activities were discussed in detail within Section 2.0 of the DETMWP (BMcD, 2001a).

Between May 2001 and July 2002, BMcD personnel completed the RI fieldwork at the 354 Site. This fieldwork resulted in the following:

- Collection of 68 groundwater-screening samples at 99 locations (38 locations were dry and yielded no water)
- Collection of 533 soil-screening samples at 270 locations
- Collection of 218 soil-gas samples at 109 locations
- Off-site laboratory analysis of selected confirmation samples (soil and groundwater)
- Collection of 217 soil samples at 51 locations for off-site analysis
- Installation of 11 monitoring wells
- Completion of four groundwater sampling events for off-site analysis
- Surveying of all direct-push sampling locations and monitoring wells

These activities are discussed in detail in this section of the RI Report. Appendix 4A of this report contains all direct-push boring logs for the 2001 field season. Appendix 4B contains all boring logs, monitoring well construction diagrams, and well development forms for the 11 monitoring wells installed. Appendix 4C presents the geotechnical data and Appendix 4D the survey data.

In addition, both groundwater and soil samples were collected during the site investigation of the Abandoned Gas Line (AGL), located at Main Post and at FFTA-MAAF. This fieldwork took place in October and November 2001 and the results are reported in the *Site Investigation Report for the Abandoned Gas Line/Terminus Area at Fort Riley, Kansas* (BMcD, 2002a) [AGL SI]. The following samples were collected during the AGL fieldwork in support of this RI:

- Collection of nine groundwater samples from three locations for off-site analysis
- Collection of 20 soil-screening samples at 20 locations

During the 2001 field season, direct-push and on-site GC analyses were performed by Environmental Priority Service (EPS). GeoCore Services Inc. (GSI) installed all monitoring wells at the 354 Site during 2001. Continental Analytical Services (CAS), a laboratory validated by USACE and certified by the State of Kansas, performed all off-site chemical analyses, and Alpha-Omega Geotech, Inc. (AOG) conducted the geotechnical laboratory testing. Kaw Valley Engineering (KVE) performed all surveying at the 354 Site.

4.1 GROUNDWATER INVESTIGATIONS

4.1.1 Plume Characterization and Delineation

4.1.1.1 Purpose

Following completion of the IFI (BMcD, 1998a), it was apparent that full delineation and characterization of the chlorinated solvent contamination associated with the 354 Site had not been completed. The RI/FS WP (BMcD, 1999a) presented a scope of work which attempted a more complete delineation of the impacted area, especially to the north of the DPW Compound. As the 1999/2000 field season progressed, the area under investigation expanded significantly, especially to the south and north of the site, as originally defined in the RI/FS WP (BMcD, 1999a). A further expansion of the area occurred as a result of fieldwork proposed in the DETMWP (BMcD, 2001a). These expansions of the area under investigation resulted from the failure of earlier rounds of field investigation to fully delineate the extent of contamination at the 354 Site.

The objective of the plume characterization and delineation was to fully describe the area impacted by chlorinated solvent contamination, and to gain insight into the aerial distribution of the various chlorinated compounds across the 354 Site.

4.1.1.2 Approach

During the initial phase of RI fieldwork (1999/2000), direct-push equipment was used to collect a total of 328 groundwater screening samples from 180 locations at the 354 Site. Detailed information on these activities was presented in Section 2.2 of the DETMWP (BMcD, 2001a).

Following the evaluation of data collected during RI fieldwork conducted during 1999 and 2000, several data gaps were identified. These included the following:

- Carbon tetrachloride (CCl_4) was detected in groundwater samples taken from the terrace area, including Monitoring Wells MW95-06 and TS0292-01, and numerous direct-push borings where groundwater screening samples were taken (see Figure 4-15 from the DETMWP). Specifically, CCl_4 was detected in the vicinity of the Building 430 and to the south of that location, near Carr Avenue, Carter Avenue, Dickman Avenue, and the DPW Compound; however, the extent was not defined. In order to define the area of CCl_4 contamination and to determine if Building 430, an active fire station, was the source of the CCl_4 contamination present to the south of that location, groundwater screening samples were collected along seven direct-push sampling lines placed between Building 434 and the intersection of Carter and Pershing Avenues (B767 through

B843, see Figure 4-1). In addition, a north/south line was placed along Pershing Avenue from Godfrey Avenue to Carter Avenue. Not all locations originally proposed were sampled.

- A single line of three groundwater-screening locations (B767 through B769, see Figure 4-1) was placed to the north of the fire station (Building 430) in an effort to define a non-detect line for CCl_4. Two additional groundwater-screening locations (B770 and B771, see Figure 4-1) were located to the northeast of the fire station (Building 430), in order to determine if any movement of contaminants had taken place in that direction.

- Ten direct-push borings (B1405 through B1414, see Figure 4-1) were advanced along and to the west of Holbrook and Dickman Avenues for groundwater-screening. An eleventh boring (B1404) was placed along Carr Avenue. The purpose of these locations was to better define the extent of CCl_4 contamination to the west of the identified plume. All groundwater-screening samples were collected and analyzed onsite for PCE, TCE, cis-1,2-DCE, CCl_4, and BTEX.

Detailed sampling procedures were described in Section 7.2 of the DETMWP (BMcD, 2001a).

Nine groundwater samples from three direct-push borings were also collected for the RI as part of the AGL investigation (BMcD, 2002a). These three locations were: AGL-01-GW11, located on the west bank of the Kansas River and co-located with Piezometer B354-00-PZ16; AGL-01-GW12, located across the river from AGL-01-GW11; and AGL-01-GW13, located on the east side of the Kansas River, about 1,300-ft south of location AGL-01-GW12 (see Figure 4-2). At each of these groundwater locations, a sample was collected from three different depth intervals. The shallow interval was located just below the water table surface, the deep interval was located just above the bedrock, and the intermediate interval was located midway between the shallow and deep sampling intervals. Groundwater samples were analyzed at the off-site laboratory for VOCs, naphthalene, TVPH, total extractable petroleum hydrocarbons (TEPH), lead, and ethylene dibromide (EDB). Each groundwater sampling location was sampled at multiple depths to confirm the presence or absence of contaminant migration under the Kansas River.

4.1.2 Monitoring Well and Piezometer Installation

4.1.2.1 Purpose

Monitoring wells were installed at locations across the 354 Site in order to provide sampling points that will provide high quality, defensible data on groundwater contamination. Locations were selected both within and outside the area of contamination. Monitoring wells within the contaminated area provide detailed information on the types of contaminants present, their concentration levels, and longer term trends (increasing or decreasing concentrations). These monitoring wells also provide data on natural attenuation parameters, such as dissolved oxygen (DO), nitrate, and sulfate. Monitoring wells located outside the contaminated areas provide "sentinel" locations, which assist in determining whether the area impacted by contamination is expanding. Piezometers were installed to provide additional information on groundwater elevations at critical locations across the 354 Site. Several of these newer piezometers, including B354-00-PZ14c, B354-00-PZ19, and B354-00-PZ20, are also sampled to provide water quality information. Figure 4-3 shows the location of all monitoring wells and piezometers at the 354 Site.

4.1.2.2 Approach

Eleven monitoring wells and 11 piezometers were installed at the 354 Site between December 1999 and April 2000. Detailed information on these monitoring wells and piezometers, including well logs, well construction diagrams, and well development forms, is included in Section 2.5 and Appendix E of the DETMWP (BMcD, 2001a).

Two of the monitoring wells installed in December 1999, Monitoring Wells B354-99-11 and B354-99-11c, were sampled as part of the RI. However, a decision was made by Fort Riley to exclude these monitoring wells from the area under investigation when Henry Drive was designated as the western boundary of the 354 Site in the area south of the UPRR grade. Water level data collected at these two monitoring wells will be retained in this report, but no analytical laboratory data will be presented herein. The regulatory agencies were informed of this and the decision has their approval.

During the 2001 RI fieldwork, eleven additional monitoring wells were installed at the 354 Site by BMcD/GSI. These included two bedrock, three overburden, and six alluvial monitoring wells. These monitoring wells were installed using standard procedures described in the Monitoring Well Installation Plan [MWIP (BMcD, 1998b)] and Section 7.0 of the DETMWP (BMcD, 2001a). Well logs, well construction diagrams, and well development forms are included in Appendix 4B. Following installation, all monitoring wells were surveyed. Locations of all monitoring wells at the 354 Site are depicted on Figure 4-3, and survey data is included in Appendix 4D. Construction data for all monitoring wells and piezometers is presented in Table 2-2.

The two bedrock and three overburden monitoring wells that were installed during the summer of 2001 were installed as detailed below:

- Monitoring Well B354-01-24 was installed as a bedrock well located along the drainage ditch to the southwest of Building 310 to investigate whether contaminants have migrated into the bedrock. The unconsolidated overburden in this area has often been dry during previous phases of the 354 Site field investigation and there were positive detections of contaminants in soil gas in this area. Monitoring Well B354-01-25 was installed as a bedrock well located immediately to the north of the UPRR station (Building 311). The overburden in this area had been dry and the monitoring well was placed to determine whether groundwater and/or contaminants were moving through the bedrock from the terrace into the Kansas River alluvial aquifer.

- Monitoring Well B354-01-26 was installed as an overburden well located southwest of Building 430 to provide information on groundwater contamination at that location. CCl_4 had been detected in groundwater screening samples from this location.

- Monitoring Well B354-01-27 was installed as an overburden well located just southwest of Building 367. This well provides data on the nature of contamination immediately downgradient from the source area located east of Building 367.

- Monitoring Well B354-01-28 was installed as an overburden well located northwest of Building 430. This well is an upgradient well, which provides background data for the terrace aquifer.

The six monitoring wells that were installed during the 2001 RI fieldwork were installed on the point bar and screened within the Kansas River alluvial aquifer. Two of these monitoring wells were installed with a HSA drill rig and four were installed as driven well points, as detailed below:

- Monitoring Well B354-01-29c was installed as an alluvial well, collocated with Monitoring Well MW95-03. This well is screened within the deep zone of the Kansas River alluvial aquifer and provides nature and extent information for the deep zone within the area impacted by contamination.

- Monitoring Well B354-01-30c was installed as an alluvial well. It is screened within the deep zone of the Kansas River alluvial aquifer and provides a side-gradient monitoring well south of the area of contamination.

- Monitoring Well B354-01-19c was installed as a driven well point and is collocated with Piezometer B354-00-PZ19. This monitoring well provides a side-gradient well screened in the deep zone of the Kansas River alluvial aquifer and is located to the north of the contaminated area.

- Monitoring Well B354-01-20c was installed as a driven well point and is collocated with Piezometer B354-00-PZ20. This monitoring well is screened within the deep zone of the Kansas River alluvial aquifer and is located within the cis-1,2-DCE contaminated area adjacent to the Kansas River.

- Monitoring Wells B354-01-31 and B354-01-31c were both installed as driven points. They are screened within the shallow and deep zones of the Kansas River alluvial aquifer, and provide side-gradient wells located to the east of the area of contamination, adjacent to the Kansas River.

All bedrock, overburden, and alluvial monitoring wells installed during the summer 2001 were developed using a gas-displacement pump to both surge and pump the wells. The smaller diameter driven points were developed using an inertial lift pump (foot valve) for initial development, followed by use of a peristaltic pump to complete development. Procedures used followed those described in the DETMWP (BMcD, 2001a) and the MWIP (BMcD, 1998b). Following development, dedicated bladder pumps were placed in all newly installed monitoring wells.

Geotechnical samples were collected from selected boreholes during monitoring well construction. Samples were analyzed for grain size, specific gravity, water content, and porosity. Samples taken from the borings for Monitoring Wells B354-01-26, B354-01-27, and B354-01-28 were also tested for hydraulic conductivity using either ASTM Method D2434 (constant head permeability) or ASTM Method D5084 (falling head permeability). Selected soil samples were also taken and analyzed at CAS for total organic carbon (TOC). Geotechnical and TOC data are presented in Table 2-3.

4.1.3 Groundwater Monitoring

4.1.3.1 Purpose

Groundwater monitoring has been conducted at the 354 Site in order to determine the nature and extent of groundwater contamination. Interim groundwater sampling events were performed prior to the completion of the final monitoring wells. A total of six interim groundwater sampling events were performed by BMcD between September 1997 and March 2001. Beginning in October 2001, a series of four sampling events were conducted for the purpose of providing data required for completion of the risk assessment at the 354 Site. These four sampling events were completed in July 2002.

4.1.3.2 Approach

Interim groundwater sampling of monitoring wells and selected piezometers was conducted at the study area in support of the RI. These interim sampling events were conducted in September 1997, November 1998, February 2000, July 2000, October 2000, and March 2001. Analytical results for these interim groundwater sampling events are included in Section 5.0 of this report, and are covered in detail in the IFIR (BMcD, 1998a) and the DSRs (BMcD, 1999b; BMcD, 2000a; BMcD, 2000b; BMcD, 2000c; and BMcD, 2001c). Table 4-1 presents those monitoring wells and piezometers sampled during each event.

Four groundwater sampling events were conducted subsequent to the completion of the full monitoring well network during the summer 2001. The data from these events, conducted in October 2001, January 2002, April 2002, and July 2002, were used to complete the risk assessment (see Table 4-1). Groundwater samples were analyzed by CAS for Target Compound List (TCL) VOCs (Table 4-2), TCL SVOCs (Table 4-3), RCRA metals (unfiltered), and the following natural attenuation (NA) parameters: methane, ethane, ethene, alkalinity, chloride, nitrate, TOC, sulfate, and sulfide. Parameters measured in the field included pH, specific conductance, temperature, DO, oxidation-reduction potential (ORP), and ferrous iron. QA/QC samples were collected, to include duplicates, equipment blanks, and MS/MSDs, as specified in the SAP. Additional VOC samples were taken at Monitoring Well B354-99-08 so that the analytical laboratory could attempt a low reporting limit detection of vinyl chloride (VC).

During the October 2001 sampling event, five monitoring wells were sampled for an expanded group of water quality parameters. This was done to provide information that would be helpful in the evaluation of various remedial technologies. The five monitoring wells included two overburden wells (B354-99-07 and B354-99-09), two alluvial monitoring wells (B354-99-12 and MPL94-01), and one bedrock monitoring well (B354-00-10). The water quality parameters analyzed included the following:

- Calcium, iron, magnesium, silica, sodium, sulfate, phosphate, nitrates, chloride, total dissolved solids, total suspended (non-filterable solids), hardness [total as calcium carbonate ($CaCO_3$)], alkalinity, chemical oxygen demand, and iron bacteria (biofouling potential).

Note that several of these parameters duplicate NA parameters discussed above. Water quality results are presented in Table 4-4.

Results for these four groundwater sampling events are included in Section 5.0 of this report, and are covered in detail in their respective DSRs (BMcD, 2001d; BMcD, 2002b; BMcD, 2002c; and BMcD, 2002d).

4.1.4 Groundwater Elevations and Automated Data Collection Platforms

4.1.4.1 Purpose

Multiple rounds of groundwater-level measurements were taken at all monitoring wells and piezometers across the 354 Site. This information was necessary to develop a detailed picture of the piezometric surface at the Site, and develop a comprehensive understanding of the hydrogeology and groundwater-flow regime at the 354 Site.

4.1.4.2 Approach

Water levels were measured immediately prior to all groundwater sampling events, using procedures described in Section 4.3.3 of the Site-Wide SAP (BMcD, 1998c). All water levels were contoured on a base map in the field in order to identify anomalies and ensure the quality of measurements. A series of 12 consecutive monthly rounds of water levels were taken, from August 2001 through July 2002. This was done to provide a record of seasonal water-level conditions across the study area. Water-level data is presented in Table 2-4, and Figures 2-9 through 2-12 present water-level maps for September 2001, and January, April, and July 2002. These data were manually contoured by a BMcD hydrogeologist.

DCPs have been installed by the USGS on numerous monitoring wells and piezometers across the 354 Site. These provided a continuous record of water-level data, which is relayed by satellite link to the USGS Water Resources Division (WRD) office in Lawrence, Kansas. This data is available online through the USGS WRD website. Many of these units have been removed by USGS personnel and only Monitoring Wells B354-00-PZ14, B354-00-PZ14c, and MPL94-01 remain equipped with DCPs as of September 2002.

4.2 SOIL INVESTIGATIONS

4.2.1 Source Characterization and Delineation

4.2.1.1 Purpose

Both soil-gas and soil sampling were performed to identify, delineate, and characterize potential source areas. Generally, soil-gas survey methods were used initially to identify potential areas for follow-on soil sampling. Following completion of the IFI (BMcD, 1998a), several areas were identified as possible source areas, which warranted additional investigation for soil contamination. The RI/FS WP (BMcD, 1999a) discussed these areas. Modifications were made to the approach as the 1999/2000 field season progressed.

Areas where soils were investigated during the 1999/2000 RI field season included:

- On-site soil screening along Dickman, Carr, and Carter Aves, and other Main Post locations.
- Soil-gas sampling both east and west of Building 367.

Areas where soils were investigated during the 2001 RI field season included:

- Soil-gas sampling around Building 430.
- On-site soil screening for PCE in the vicinity of Building 367.
- Soil sampling for off-site analysis from Building 332, former Building 354, wash rack at Building 332, Building 367, and Building 430.

In addition, as part of the AGL site investigation, soil samples were collected and analyzed onsite from 20 direct-push borings located along the sanitary sewer line which runs parallel to and just southeast of the UPRR grade (BMcD, 2002a). This was done in an effort to determine whether the sewer line was a possible source for contamination detected on the point bar.

Each of these soil investigations will be described in more detail in the following section.

4.2.1.2 Approach

On-Site Soil Screening (Main Post)

Logging, field screening, and sampling of soils for both on-site and off-site lab analysis were performed at multiple direct-push borings during the summer and fall 1999 fieldwork (see Figure 2-2 from the DETMWP [BMcD, 2001a]). At locations specified in the SSAP (BMcD, 1999c), soil samples were collected for on-site GC analysis. These samples were collected from the following areas:

- At Direct-Push Borings B113, B114, B117, and B118, located along the drainage ditch between Buildings 301 and 310.
- At Direct-Push Borings B119, B120, and B121, located just east of Dickman Avenue and west of the DPW Compound.
- At Direct-Push Borings B131 through B134, B136 through B138, B140, B143, B145, and B147, located in the vicinity of the UPRR station (Building 311).
- At Direct-Push Borings B217 and B218A, located just east of Building 367.

A total of 70 soil-screening samples were collected at 20 boring locations for field GC analysis for BTEX, PCE, TCE, cis/trans-1,2-DCE, and 1,2-DCA. Procedures were described in Section 7.2 of the DETMWP (BMcD, 2001a).

Soil-Gas Sampling – Building 367

During the spring 2000 RI fieldwork, direct-push equipment was used to collect a total of 110 soil-gas samples from 57 direct-push borings in an area located between Carr and Carter Avenues. This effort attempted to delineate possible source areas around Building 367. The field data are presented and discussed in Section 4.0 of the DETMWP (BMcD, 2001a).

Soil-Gas Sampling - Building 430

During the 2001 RI field season, a second soil-gas investigation was conducted with the purpose of isolating any shallow source of chlorinated VOCs, specifically targeting CCl_4, which had been detected in groundwater just south of Building 430. A sampling grid composed of equilateral triangles with sampling locations on 20-ft centers was laid out, extending in a radial pattern from the building to a distance of 100-ft. An iterative method was used to investigate the area defined by the grid. Not all locations on the grid were sampled.

Using direct-push sampling equipment, soil-gas samples were obtained from two depth intervals at each sampling location. A shallow sample was collected at a depth of eight- to ten-ft bgs. A second sample was collected at a depth of approximately 14- to 16-ft bgs. All soil-gas samples were analyzed in the field with a GC for CCl_4, PCE, TCE, cis-1,2-DCE, and BTEX.

Soil-gas sampling began immediately adjacent to Building 430, then stepped out to 40-ft and evaluated on 40-ft centers. The field analytical data for these locations was then evaluated to determine which direction(s) and how far (20- or 40-ft) to step out for the next series of samples. The soil-gas investigation proceeded in the direction of positive contaminant detections. When non-detect points were reached, the investigation then stepped back for further delineation and infilling. Ultimately, the area of the soil-gas investigation expanded well to the south of Building 430 (Figure 4-4). Field duplicates were collected and analyzed at a minimum of ten percent of the total samples taken.

On-Site Soil Screening for PCE – Building 367

Soil, soil-gas and groundwater samples collected during the RI indicated the presence of chlorinated solvents (PCE, TCE, 1,2-DCE, and CCl_4) in the areas immediately west and east of Building 367. Subsurface soil samples were collected in this area to locate and define potential sources of contamination in the soil. Soil analytical results were also to be used to evaluate potential exposure in the risk assessment. Soil sampling consisted of a two-stage process. Initially, soil samples were collected across the area and analyzed on site for PCE only. Based upon the results of this on-site screening, a total of 18 locations were selected for soil sampling for off-site laboratory analysis. In addition, several soil samples were collected along the sanitary sewer line located east of Building 367 to determine if this was a potential source of soil and groundwater contamination (B1398 through B1403 [six locations]; see Figure 4-5).

Soil sampling with on-site analysis was conducted for the purpose of locating and defining shallow sources of PCE, which had been detected in both soil gas and groundwater in this area. Figure 4-5 depicts the sampling grid for this area, which was composed of an equilateral triangular grid, with sampling locations on ten-ft centers (Direct-Push Borings B1022 through B1397). This grid covered an area both east and west of Building 367 where PCE detections in soil gas were equal to or greater than approximately 100 μg/L. An iterative method was used to investigate the grid and not all locations were sampled (as described in Section 7.2.3 of the DETMWP). Based on ELIPGRID calculations, this ten-ft triangular grid resulted in a confidence level of 100 percent of finding a 7.5-ft diameter or larger circular source, and a 91 percent confidence level of locating a five-ft diameter circular source.

Soil sampling and analysis began in those areas that previously had the highest ("hottest") soil-gas readings both west and east of Building 367. The field crew then began to step-out to the next set of direct-push borings around the "hot spot" and collect soil samples for on-site analysis. This effort continued until soil analytical results dropped to a threshold level, which was determined in consultation with both USACE and Fort Riley DES personnel.

Soil samples were collected using van-mounted direct-push equipment following the procedures outlined in Section 4.4.2 of the Site-Wide SAP (BMcD, 1998c). A Macrocore (two-inch diameter) soil sampler with acetate liners was driven to one-ft bgs, and then in three-ft intervals to 15-ft bgs. PID readings were obtained along the entire length of the sample. Soil-sampling intervals began below any surface pavement and/or gravel sub-grade. A boring log was prepared for each direct-push sampling location. Subsurface materials were described using the procedures outlined in Section 7.0 of the Site Wide MWIP

(BMcD, 1998b). Soil samples for analysis of PCE were collected from depths of approximately nine and 15-ft bgs, and were analyzed in the field with a mobile GC. Direct-push borings were abandoned following the procedures outlined in Section 10.2 of the Site-Wide MWIP (BMcD, 1998b).

A total of six soil samples were taken along the sanitary sewer line that crosses the block between Carr and Carter Avenues, to the east of Building 367. These locations (B1398 through B1403) were located along the sewer line, with B1400 and B1401 being located approximately five- to ten-ft from each side of the manhole cover in the middle of the block (see Figure 4-5). The field crew then determined the depth to the bottom of the sewer line at the manhole. Based on this, the direct-push sampler was driven to a depth approximately three-ft below the bottom of the sewer line. Soil samples were taken and analyzed on site for PCE, TCE, cis-1,2-DCE, CCl_4, and BTEX. All procedures described above for soil sampling also applied to these direct-push borings (i.e. logging, QA/QC, and abandonment of borings).

Soil Sampling for Off-Site Analysis – Multiple Locations

In order to determine the nature and extent of contamination at this location and evaluate the risk to the utility worker scenario, soil samples were taken at selected locations for off-site laboratory analysis. Following a detailed analysis of soil-gas and soil-screening results, the decision was made to collect soil samples for off-site analysis from the following locations (Figure 4-6):

- Nine sampling locations just southeast of Building 332 in the DPW Compound (B150 through B158).
- Nine sampling locations in the vicinity of the former Building 354 UST pits (B165 through B173).
- Six sampling locations in vicinity of the former wash rack area, just northwest of Building 332 (B159 through B164).
- Eighteen sampling locations in the vicinity of Building 367 (B2144S, B2183S, B2203S, B2322S, B2325S, B2333S, B2335S, B2336S, B2337S, B2344S, B2345S, B2347S, B2350S, B2358S, B2360S, B2369S, B2370S, and B2429S).
- Nine sampling locations to the south of Building 430 (B887S, B888S, B901S, B902S, B916S, B918S, B925S, B934S, and B943S).

In order to determine the nature and extent of contamination at these locations and evaluate the risk to the utility worker scenario, the following four soil-sampling intervals were selected: ground surface to one-ft bgs (surface soil), one- to four-ft bgs, four- to seven-ft bgs, and seven- to ten-ft bgs. Soil samples were collected using van-mounted direct-push equipment, following the procedures outlined in Section 4.4.2 of the Site Wide SAP (BMcD, 1998c). A Macrocore (two-inch diameter) soil sampler with acetate liners was driven with the direct-push equipment to one foot bgs, and then in three-ft intervals to ten-ft bgs. Upon reaching a depth of approximately ten-ft, the sampler was driven in four-ft intervals to the top of bedrock. PID readings were obtained along the length of each sample. The on-site geologist had the option of taking additional soil samples for off-site analysis at depths below ten-ft bgs if PID screening indicates the presence of VOCs. Soils were analyzed at the off-site laboratory for VOCs and polycyclic aromatic hydrocarbons (PAHs). Soil-sampling intervals began below any surface pavement and/or gravel subgrade.

Boring logs were prepared for each direct-push sampling location. Subsurface materials were described using the procedures outlined in Section 7.0 of the MWIP (BMcD, 1998b). Soil samples selected for VOC analysis were collected from discrete, one-ft intervals that exhibit the highest PID reading. Soil from the remainder of the sampler was homogenized according to Section 4.4.3.2 of the Site Wide SAP (BMcD, 1998c) and packed in containers for PAH analysis. All subsurface soil samples collected for off-site analysis were analyzed by CAS. All direct-push borings were abandoned following the procedures outlined in Section 10.2 of the MWIP (BMcD, 1998b).

Soil Sampling – AGL Investigation

Twenty soil-screening samples were collected from 20 direct-push boring locations (AGL-01-SB93 through AGL-01-SB112) in support of the RI as part of the AGL SI during October 2001 (BMcD, 2002a). The sample locations were established at 100-ft intervals along the sanitary sewer, which trends northeast from the intersection of Henry Drive and the UPRR grade. Soil samples were collected from six- to eight-ft bgs or from the interval which displayed the highest PID screening value. These samples were analyzed on site with a GC for TVPH, TEPH, PCE, TCE, cis-1,2-DCE, BTEX, CCl_4, and 1,2-DCA. This was done in an effort to determine whether the sewer line was a possible source for some of the contamination detected on the point bar. These direct-push boring locations are depicted on Figure 4-2.

4.3 SURFACE WATER INVESTIGATIONS

4.3.1 Purpose

The USGS has conducted surface-water sampling of the Kansas River at Fort Riley in order to determine whether contamination from sites adjacent to the river has impacted the river. These sites include the 354 Site, DCFA, FFTA-MAAF, and Southwest Funston Landfill/Camp Funston (SFL/CF).

4.3.2 Approach

The USGS conducted surface-water sampling of the Kansas River in March 2000, July 2000, and July 2001. This sampling took place along either three transects (March and July 2000) or five transects (July 2001), located adjacent to the point bar (see Figure 2-2, View A, from the DETMWP [BMcD, 2001a]). Results of the surface-water sampling are discussed in Section 4.0 of the DETMWP and in the quality control summary reports (QCSRs)/Quality Control Technical Memorandum (QCTM) (BMcD, 2000d; BMcD, 2000e; and BMcD, 2001e).

4.4 INVESTIGATION DERIVED WASTE MANAGEMENT

Investigation derived waste (IDW) was managed in accordance with procedures described in Section 7.3 of the DETMWP (BMcD, 2001a).

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5.0 NATURE AND EXTENT OF CONTAMINATION

Section 5.0 describes the nature and extent of soil, groundwater, and surface-water contamination at the 354 Site. This section builds on the nature and extent information presented previously in the DETMWP and provides additional information based on work conducted during the 2001 RI field season. This section is organized into the following subsections:

- Section 5.1 briefly discusses the primary source areas.
- Section 5.2 discusses background for metals.
- Section 5.3 provides an overview of contamination across the 354 Site.
- Section 5.4 discusses soil contamination, including VOCs, SVOCs, petroleum products, and metals. A detailed discussion of the results of 2001 fieldwork results will be included (Building 430 soil-gas investigation and soil sampling at Buildings 430, 367, and 332).
- Section 5.5 discusses groundwater contamination, with an emphasis on VOCs. In addition, a detailed discussion of groundwater screening conducted during the 2001 RI field season will be included and a discussion of quarterly groundwater sampling results.
- Section 5.6 discusses surface water contamination.
- Section 5.7 provides a summary of the nature and extent of contamination at the 354 Site.

This discussion will place its emphasis on those chemical compounds which were identified in the DETMWP as preliminary chemicals of potential concern (COPCs) (BMcD, 2001a). These chemicals include the following: PCE and related compounds (TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE and VC), 1,2-DCA, CCl_4 and related compounds (trichloromethane, dichloromethane, and chloromethane), and BTEX petroleum constituents. Although not retained as COPCs in the DETMWP, SVOCs, PAHs, and metals will also be addressed in this section.

5.1 SOURCES

A variety of activities have been conducted at the 354 Site, which could have resulted in the development of sources of both chlorinated solvents and hydrocarbon contamination. These include facilities for the storage and maintenance of motorized equipment, facilities for storing and dispensing fuel and oil for vehicles, and at least one area where fire fighting equipment may have been serviced or used for training. Specific locations identified as possible source areas include the following (see Figure 5-1):

- Building 367 and adjacent paved areas. This area was long used for storage and maintenance of vehicles and other military equipment, including artillery pieces. It is a source for chlorinated solvents, which may have been used for cleaning and degreasing metal parts. This area was paved sometime between the late 1970s and the early 1990s.

- Building 332, former Building 354, its associated USTs, and adjacent areas of the DPW Compound. This area is currently used for vehicle maintenance. It is a possible source of chlorinated solvents, which may have been used for cleaning and degreasing metal parts. The former service station (354) is a source for hydrocarbon and possibly chlorinated solvent contamination. The former petroleum unloading facility and associated gasoline pipeline located along the UPRR grade will also be included with this general area.

- Building 430, which is an active fire station. This building and the immediate area are a possible source for carbon tetrachloride as a result of the maintenance and/or training with fire fighting equipment.

- Former service station to northwest of UPRR depot. This area is a possible source of hydrocarbon contamination.

BTEX has been detected at the 354 Site and is addressed in this discussion of nature and extent of contamination. However, because CERCLA excludes petroleum, the BTEX contamination found in the study area is a secondary issue to the RI/FS when compared to the CERCLA-regulated chlorinated solvents found in the study area. Therefore, those areas which are sources for chlorinated solvents, such as Buildings 367, 332, and 430, and their adjacent areas will receive the emphasis in the subsequent discussion.

5.2 BACKGROUND VALUES FOR METALS

5.2.1 Background for Metals in Soils

A discussion of background for metals in soil was included as part of Section 4.0 of the DETMWP (BMcD, 2001a). The discussion of metals in soils and the conclusions from the DETMWP are provided in the following text.

A total of 16 soil samples were taken at 15 different direct-push sampling locations during the 1999/2000 phase of the RI fieldwork. These soil samples were analyzed offsite for the eight RCRA metals (see

Table 5-1 in this report and Figure 4-1, View B in the DETMWP). The following are results of these analyses, which are also compared to local (FFTA-MAAF) and regional (USGS) background values, and the residential KDHE Tier 2 Risk-Based Standards (RSKs), which are the most conservative. Also included are data related to the average composition of shale and limestone, including the Upper Paleozoic shales of Kansas (Cubitt, 1979 and Hem, 1985).

- Arsenic was detected at concentrations ranging from non-detect to 4.7 milligram per kilogram (mg/kg) at Direct-Push Boring B117 (depth three- to four-ft bgs). Detections were at or below the range for both local and regional background levels for arsenic, and all detections were below the residential KDHE RSKs for both the soil and soil-to-groundwater protection pathways.

- Barium was detected at concentrations ranging from 15 mg/kg (at B132, 19- to 20-ft bgs) to 170 mg/kg (at B137). Detections were below the range for regional background levels for barium, and all detections were below the residential KDHE RSK for the soil pathway (there is not a KDHE RSK value for barium for the soil-to-groundwater protection pathway).

- Cadmium was detected at concentrations ranging from non-detect to 0.6 mg/kg (at B118). Detections were at or below the range for both local and regional background levels for cadmium. All detections were below the residential KDHE RSK for the soil pathway (there is not a KDHE RSK value for cadmium for the soil-to-groundwater protection pathway).

- Chromium was detected at concentrations ranging from 3.0 mg/kg (at B132, 19- to 20-ft bgs) to 15.3 mg/kg (at B119). Detections were at or below the range for both local and regional background levels for chromium. All detections were below the residential KDHE RSK for the soil pathway (there is not a KDHE RSK value for chromium for the soil-to-groundwater protection pathway).

- Lead was detected at concentrations in excess of both local and regional background levels, but well below the residential KDHE RSK value for the soil protection pathway (there is no value for lead for the soil-to-groundwater protection pathway). Lead was detected at concentrations ranging from 2.8 mg/kg (at B132, 19- to 20-ft bgs) to 51 mg/kg (at B117, three- to four-ft bgs). The 51 mg/kg detection (B117) and the detection of 35 mg/kg at B118 (depth 2.5- to four-ft bgs) are both below the residential KDHE RSK value for the soil protection pathway of 400 mg/kg for lead. Both detections are above the value for local background at FFTA-MAAF of 32.3 mg/kg and the regional value of 15 mg/kg (Table 4-2 from the DETMWP). Both of these soil samples were collected from the drainage located to the west of Buildings 309 and 310. Lead was also detected in soil samples collected along the sanitary sewer as part of the AGL investigation. Lead was detected in samples from three direct-push borings (AGL-01-SB93, AGL-01-SB98, and AGL-01-SB112) at concentrations ranging from 2.4 to 5.1 mg/kg (see Figure 4-2). It should be noted that tetraethyl lead was once commonly used as a fuel additive.

- Mercury, selenium, and silver were not detected in soils from the study area.

Metals in soils were generally detected at concentrations below regional background levels, with the exception of lead. However, the detected concentrations of lead were below regulatory screening levels. Since most metals were detected at concentrations below background, and the detected concentrations of all metals were below regulatory screening levels, no metals were retained as COPCs. There are no known sources for metals located within the 354 Site and no additional metals sampling in soils were performed during the 2001 RI field season.

5.2.2 Contaminant Comparison to Background for Metals in Groundwater

To properly evaluate the nature and extent of contamination at a site, the levels of naturally occurring chemicals must be taken into consideration. In order to properly determine background concentrations for an element or compound, the following criteria must be used to determine background sampling locations: a monitoring well must be beyond the influence of any source of contamination; the monitoring well must be free of detections, other than metals; and the well must have been sampled enough times so that a statistically meaningful analysis can be performed on the data.

Because only four rounds of groundwater sampling were performed at the 354 Site in which RCRA metals were analyzed for, there were an insufficient number of rounds for a meaningful statistical analysis of this data. Therefore, a decision was made to use the background concentrations calculated for the FFTA-MAAF site. This is a reasonable approach, since the monitoring wells at the 354 Site with levels of metals above regulatory standards are located within or immediately adjacent to the Kansas River alluvial aquifer. This is the same aquifer for which background values were determined for the FFTA-MAAF RI. This data is provided in Section 5.2 of the FFTA-MAAF RI Report (BMcD, 2001b). Background values (as determined for the FFTA-MAAF RI) for four of the five RCRA metals detected at the 354 Site were as follows: arsenic – 0.02 milligram per liter (mg/L); chromium – 0.0065 mg/L; lead – 0.012 mg/L; and mercury – 0.0002 mg/L. A background value was not determined for barium as part of the FFTA-MAAF study. An informal (i.e. not rigorously quantitative) evaluation of metals background from six monitoring wells/piezometers completed within the Kansas River alluvial aquifer at the 354 Site was performed for comparison purposes. This included Monitoring Wells/Piezometers B354-00-PZ14c, B354-00-PZ19, B354-01-19c, B354-01-31, B354-01-31c, and PSF92-05. Background values were determined by simply averaging all values for a given metal. These background values were: arsenic – 0.013 mg/L; barium – 0.18 mg/L; chromium – 0.0018 mg/L; lead – 0.0015 mg/L; and mercury – 0.0001 mg/L. These values were generally comparable to the FFTA-MAAF values, with the exception of lead, which was an order of magnitude lower at the 354 Site.

Five of the RCRA metals were detected in groundwater samples collected from the 354 Site between fall 2001 and summer 2002. Additionally, some RCRA metals were detected in groundwater samples collected during previous groundwater sampling events. The following bullets briefly discuss the detections of RCRA metals in groundwater at the 354 Site, and the comparison of those detections to background values and the USEPA MCLs:

- Arsenic was detected during one or more sampling events at 17 monitoring wells at the 354 Site. This represented 62 detections out of 160 samples collected (39 percent). Monitoring Wells TS0292-02 and B354-99-13c had detections that exceeded the current USEPA MCL for arsenic of 0.05 mg/L (the USEPA will decrease this MCL to 0.01 mg/L by 2006). Monitoring Well TS0292-02 had three detections in excess of the MCL; 0.0645 mg/L (September 1997), 0.116 mg/L (November 1998), and 0.09 mg/L (October 2001). Monitoring Well B354-99-13c had three detections in excess of the MCL between October 2001 and April 2002. These ranged between 0.058 and 0.051 mg/L. All exceeded the background value for arsenic of 0.02 mg/L. In all, thirty-nine percent (24) of the detections equaled or exceeded the background value. Virtually all detections of arsenic were at monitoring wells screened within the Kansas River alluvial aquifer. The only exception was Monitoring Well TS0292-02, which is located immediately adjacent to the Kansas River alluvial aquifer.

- Barium was detected during one or more sampling events at 32 monitoring wells at the 354 Site. This represented 132 detections out of 160 samples collected (83 percent). The highest concentration detected was 1.07 mg/L at Monitoring Well TS0292-02 during September 1997. All detections were below the USEPA MCL of 5.0 mg/L. No background value is available for barium.

- Chromium was detected during one or more sampling events at 32 monitoring wells/piezometers at the 354 Site. This represented 81 detections out of 160 samples collected (51 percent). The highest concentration detected was 0.086 mg/L at Piezometer PZ-C during October 2001. All detections were below the USEPA MCL of 0.1 mg/L for chromium. The background value for chromium was 0.0065 mg/L. Fifteen percent (12) of the detections equaled or exceeded the background value.

- Lead was detected during one or more sampling events at only five monitoring wells/piezometers at the 354 Site: TS0292-02, MW95-04, PZ-C, PZ-D, and MPL94-02. This represented 11 detections out of 160 samples collected (seven percent). The highest detection was at Piezometer PZ-D, which had a concentration of 0.016 mg/L during January 2002. This was the only detection that exceeded the USEPA action level of 0.015 mg/L and the background value for lead of 0.012 mg/L. This piezometer is sampled with a bailer and turbidities tend to be elevated above 30 NTUs. The usual procedure is to purge the monitoring well and then sample for all analytes with the exception of metals. After letting the monitoring well settle out overnight, the field crew will return the next morning to collect the metals sample. However, it is still possible that metals adhering to soil particles will result in elevated metals concentrations at this monitoring well.

As part of the AGL SI, groundwater samples were taken at three locations by direct-push methods. One location was west of the Kansas River and two of these locations were on the east side of the Kansas River (see Figure 4-2). A total of nine samples were collected from these direct-push borings (three different depths per boring), seven of which had detections of lead ranging from 0.009 to 0.093 mg/L. With the exception of one sample, all these detections exceeded both the USEPA action level and the background level for lead. The use of direct-push methods to collected groundwater samples often results in samples that contain a high percentage of suspended solids. Field personnel reported that the groundwater samples collected from these locations were cloudy; therefore, it must be assumed that the turbidities in these samples were high. High turbidity may increase the groundwater metals concentration due to the contribution of metals generated from soil particles. Groundwater samples collected from other 354 Site monitoring wells in the vicinity, that were micropurged and had final turbidities below 30 NTUs, were all non-detect for lead.

- Mercury was detected only once, at Monitoring Well MW95-06 in April 2002. The concentration was 0.0002 mg/L, which was at the reporting limit for this compound, and was below the USEPA MCL of 0.002 mg/L. The background value for mercury was determined to be 0.0002 mg/L.

As discussed above, both arsenic and lead were present in groundwater at the 354 Site at levels that exceed both the USEPA MCL/action levels and the background levels, as determined at FFTA-MAAF. Chromium was present at levels above background, but below regulatory guidelines. Mercury was detected at background levels, but below its MCL. A background value was not available for barium, but all detections of barium were at concentrations below regulatory guidelines. Because groundwater is not considered useable as a drinking water source and is generally too deep to be directly contacted, metals in groundwater were not quantified as part of the human health risk assessment. Arsenic, barium, chromium, and lead were evaluated for ecological risk (see Section 8.0 of this report).

5.3 OVERVIEW OF CONTAMINATION IN THE ENVIRONMENT

As discussed above in Section 5.2, arsenic, barium, cadmium, chromium, and lead were detected in soils at the 354 Site. All detections in soils were below regulatory standards; however, lead was detected at concentrations that exceeded regional background values. No specific sources for metals have been identified at the 354 Site; however, tetraethyl lead was once commonly used as a fuel additive. Arsenic, barium, chromium, lead, and mercury were detected in groundwater at the 354 Site. Only arsenic and lead were detected at concentrations in excess of USEPA MCL/action levels. These detections were all located within or immediately adjacent to the Kansas River alluvial aquifer.

Chlorinated solvents, to include PCE, TCE, and cis-1,2-DCE, are present in soils and the vadose zone at the 354 Site. The primary source area appears to be located just east of Building 367, where elevated concentrations of PCE in soil have been detected. Some chlorinated solvent contamination is also present in the vicinity of the DPW Compound and the fire house on Godfrey Avenue appears to be a low level source of CCl_4. Petroleum compounds (BTEX) are present in soils in the vicinity of the DPW Compound and also in soils from the vicinity of the former service station along Dickman Avenue.

Chlorinated solvents, including PCE, TCE, cis-1,2-DCE, and CCl_4 have been detected in groundwater from both the terrace and Kansas River alluvial aquifers. The highest concentrations of these compounds have been detected in groundwater samples collected from the terrace aquifer immediately east and downgradient of Building 367. These compounds are also present in the Kansas River alluvial aquifer, but at significantly lower concentrations. Petroleum compounds are present locally, mainly in samples collected from monitoring wells at and immediately south of the DPW Compound. Although very low concentrations of cis-1,2-DCE have been detected at monitoring wells immediately adjacent to the Kansas River, contaminants have not been detected in surface-water samples taken from the Kansas River.

5.4 SOILS AND VADOSE ZONE CONTAMINATION

This section will address the nature and extent of contamination in the soils and vadose zone at the 354 Site. This discussion will integrate results from on-site soil-gas investigations, on-site soil-screening data, and off-site soil analytical data. VOCs, SVOCs (including PAHs), petroleum products (including BTEX), and metals will be addressed.

5.4.1 Volatile Organic Compounds

The following discussion will address the nature and extent of VOC contamination in soils across the 354 Site. The Building 367 Area of Interest (AOI) will be discussed first, followed by the former Building 354/Building 332/DPW Compound AOI, the Building 430 AOI, and the Former Service Station (Dickman Ave) AOI. The emphasis in this section will be a discussion of the chlorinated VOCs and their degradation products.

5.4.1.1 Building 367 AOI

This section will address the nature and extent of VOC contamination at the Building 367 AOI, with emphasis on the results of the following field activities:

- The soil-gas survey conducted during the 1999/2000 RI field season.
- On-site soil screening conducted during the 2001 RI field season.
- Soil sampling for off-site laboratory analysis conducted during the 2001 RI field season.

5.4.1.1.1 Building 367 On-Site Soil-Gas Survey

Soil-gas sampling, with on-site analysis, provides a screening tool for potential soil and groundwater contamination source areas. Soil-gas detections may indicate volatilization of soil contamination into soil pore space. Alternatively, in sandy soils or in areas with extensive pavement and blacktop, soil-gas detections may indicate volatilization of groundwater contamination into soil pore space. During the 1999/2000 RI field season, a soil-gas survey was conducted in the area both east and west of Building 367, between Carr and Carter Avenues. A discussion of this activity is presented in Section 4.2.1.2 of this report. Figures 4-3 through 4-8 in the DETMWP (BMcD, 2001a) present the soil-gas results for this survey. Table 4-3 from the DETMWP presents the soil-gas data from this area. Significant soil-gas results include:

- PCE was detected at 43 of 49 soil-gas sampling locations at the nine-ft bgs sampling depth in the area between Carr and Carter Avenues. PCE detections ranged from a high of 250 μg/L (at B243) to a low of 0.2 μg/L (at B232, B363). Six locations had readings in excess of 100 μg/L (see Figure 4-3 in the DETMWP). PCE was detected at 48 of 53 soil-gas sampling locations at the 15-ft bgs sampling depth. Values ranged from a high of 450 μg/L (at B241) to a low of 0.1 μg/L (at B444). Eleven locations had readings in excess of 100 μg/L (see Figure 4-4 in the DETMWP).

- TCE was detected at ten of 49 soil-gas sampling locations at the nine-ft bgs sampling depth in the area between Carr and Carter Avenues. Detections ranged from a high of 40 μg/L (at B243) to a low of 0.2 μg/L (at B518) (see Figure 4-5 in the DETMWP). TCE was detected at 17 of 53 soil-gas sampling locations at the 15-ft bgs sampling depth. Values ranged from a high of 46 μg/L (at B241) to a low of 0.1 μg/L (at B443) (see Figure 4-6 in the DETMWP).

- cis-1,2-DCE was detected at four of 49 soil-gas sampling locations at the nine-ft bgs sampling depth in the area between Carr and Carter Avenues. Detections ranged from a high of 98 μg/L (at B243) to a low of 1.6 μg/L (at B245) (see Figure 4-7 in the DETMWP). cis-1,2-DCE was detected at eight of 53 soil-gas sampling locations at the 15-ft bgs sampling depth. Values ranged from a high of 87 μg/L (at B243) to a low of 1.5 μg/L (at B245) (see Figure 4-8 in the DETMWP).

Areas where soil-gas detections were observed, which indicated soil contamination at shallow depths, were located immediately west and east of Building 367. PCE was more widespread at the 15-ft versus nine ft sampling depth (see Figures 4-3 and 4-4 in the DETMWP). Concentrations observed were also higher at the 15-ft sampling depth. TCE detections in soil gas were less extensive, but still present both east and west of Building 367 (see Figures 4-5 and 4-6 in the DETMWP). cis-1,2 DCE detections were present mainly at the 15-ft depth and were located primarily to the east of Building 367 (see Figures 4-7 and 4-8 in the DETMWP). In agreement with the soil-gas sample results, soil samples from two locations to the east of Building 367 (see Figure 4-1, View A in the DETMWP) exhibited chlorinated-solvent contamination.

5.4.1.1.2 Building 367 On-Site Soil Screening

The initial set of soil-screening samples collected adjacent to Building 367 during the 1999/2000 RI field season exhibited chlorinated solvent contamination (a discussion of this activity is presented in Section

4.2.1.2 of this report). Chlorinated VOCs were detected in soil samples collected from Direct-Push Borings B132, B133, B217, and B218A (see Figure 4-1 in the DETMWP). Chlorinated VOCs were also detected in the off-site confirmation sample for B132. All these detections were below the residential KDHE RSKs for both the soil and the soil-to-groundwater protection pathways. The following bullets summarize these detections:

- At location B217 (east of Building 367), PCE was detected at 2.0 μg/kg from soil samples collected from both 14 and 28.5-ft bgs. At location B218A (east of Building 367), PCE was detected at a level of 11 μg/kg in soil collected from 16-ft bgs. The corresponding off-site laboratory confirmation sample was non-detect for PCE.

- TCE was detected at a level of 2.0 μg/kg in a soil sample collected from 16-ft bgs at location B218A (east of Building 367). The corresponding off-site laboratory confirmation sample was non-detect for TCE.

- cis-1,2-DCE was detected at a level of 26 μg/kg in a soil sample collected from 16-ft bgs at location B218A (east of Building 367). The corresponding off-site laboratory confirmation sample was non-detect for cis-1,2-DCE.

A soil-screening survey, with on-site analysis, was performed at Building 367 during June and July of the 2001 RI field season. Soil sampling was conducted at 263 direct-push borings, with samples taken from both nine and 15-ft bgs. Results are presented in Table 5-2, and Figures 5-2 and 5-3. Significant results are presented in the following bullets:

- PCE was detected in soil at 224 direct-push borings at the nine-ft bgs depth. This represents 85 percent of the total samples taken at this depth. The highest concentration detected was at Direct-Push Boring B2347, with a concentration of 1,200E μg/kg. This sample was run on the field GC as a 1:2 dilution, and the result is an estimated value (E) above the calibration range of the instrument. Fifteen of the locations had results in excess of the 180 μg/kg residential KDHE RSK standard for the soil-to-groundwater protection pathway. The main area of PCE detections was located to the east of Building 367 (Figure 5-2).

- At the 15-ft bgs sampling depth, there were detections of PCE at a total of 166 direct-push borings. This represents 63 percent of the total samples taken at this depth. The highest detection was at Direct-Push Boring B2337. This result, at a concentration of 610 μg/kg, plus a detection of 180 μg/kg at Direct-Push Boring B2359, were the only two at the 15-ft bgs level which equaled or exceeded the 180 μg/kg residential KDHE RSKs standard for the soil-to-groundwater protection pathway. The impacted area at the 15-ft bgs depth is very similar in extent to that at nine-ft bgs (Figure 5-3).

- Seven samples were taken at a depth of approximately 13-ft bgs along the sanitary sewer line located to the east of Building 367. None of these samples had detections of PCE, TCE, CCl_4, or BTEX above their respective detection limits.

5.4.1.1.3 Building 367 Soil Sampling for Off-Site Laboratory Analysis

Eighteen direct-push soil borings were advanced in the vicinity of Building 367 for the purpose of collecting soil samples for off-site laboratory analysis (a discussion of this activity is presented in Section 4.2.1.2 of this report). Three of these direct-push borings were located to the west of Building 367 and 15 were located to the east of the building (Figure 4-6). For this discussion, the areas to the west and east of Building 367 will be addressed separately. Analytical results are presented in Tables 5-3 and 5-4, and Figures 5-4 through 5-15 present the distribution of PCE, TCE, and cis-1,2-DCE at the four sampled depth intervals.

PCE, TCE, cis-1,2-DCE, acetone, and carbon disulfide were detected in the three direct-push borings located to the west of Building 367.

- PCE was detected in all three direct-push borings at depths ranging from ground surface to four-ft bgs. The highest detection of PCE was at Direct-Push Boring B2144S, with a concentration of 2,140 μg/kg (one- to four-ft bgs). This was above the residential KDHE RSK value of 180 μg/kg for the soil-to-groundwater protection pathway. The highest detections at Direct-Push Borings B2183S and B2203S were 110 μg/kg (one- to four-ft bgs) and 100 μg/kg (zero- to one-ft bgs), respectively (see Figures 5-4 through 5-7).

- TCE was detected in soils from Direct-Push Borings B2144S and B2203S. The highest concentration was in Direct-Push Boring B2144S, at 186J μg/kg (one- to four-ft bgs). Direct-Push Boring B2203 had a low detection for TCE of 8.6J μg/kg (zero- to one-ft bgs). These detections were all below both the KDHE RSK soil and soil-to-groundwater protection standards (residential) for TCE, which are 62,000 μg/kg and 200 μg/kg, respectively (see Figures 5-8 through 5-11).

- cis-1,2-DCE was detected only at Direct-Push Boring B2144S. The highest concentration detected was 827J μg/kg (four- to seven-ft bgs). This was in excess of the residential KDHE RSKs value for the soil-to-groundwater protection pathway value of 800 μg/kg.

- Acetone and carbon disulfide were detected in soil from Direct-Push Boring B2203S. Acetone was detected at a concentration of 130J μg/kg (zero- to one-ft bgs) and carbon disulfide was detected at a concentration of 6.1J μg/kg (zero- to one-ft bgs). These concentrations were below both the KDHE RSK soil (acetone – 1,700,000 μg/kg; carbon disulfide – 460,000 μg/kg) and soil-to-groundwater (acetone – 1,100 μg/kg; carbon disulfide – 140 μg/kg) protection standards (residential).

PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, and/or acetone were detected in all 15 of the direct-push borings located to the east of Building 367.

- PCE was detected at levels above the residential KDHE RSKs value for the soil-to-groundwater protection pathway in the area east of Building 367. PCE was detected at all 15 direct-push borings at one or more of the sampled depth intervals (see Figures 5-4 through 5-7). For the zero- to one-ft bgs depth interval, PCE detections ranged from 13,200 μg/kg at Direct-Push Boring B2335S to 11J μg/kg at Direct-Push Boring B2336S. Ten locations in the zero- to one-ft bgs interval had PCE concentrations that exceeded the residential KDHE RSK value for soil-to-groundwater protection pathway of 180 μg/kg.

  For the one- to four-ft bgs depth interval, PCE concentrations ranged from 29,000 μg/kg at Direct-Push Boring B2335S to 7.8 μg/kg at Direct-Push Boring B2429S. Fourteen locations in the one- to four-ft bgs interval had PCE concentrations that exceeded the residential KDHE RSK value for the soil-to-groundwater protection pathway.

  For the four- to seven-ft bgs depth interval, PCE detections ranged from 860J μg/kg at Direct-Push Boring B2337S to 37.4 μg/kg at Direct-Push Boring B2350S. Eight locations in the four- to seven-ft bgs interval had PCE concentrations that exceeded the residential KDHE RSK value for the soil-to-groundwater protection pathway. One location (B2429S) was non-detect in this interval. For the seven- to ten-ft bgs depth interval, PCE detections ranged from 262 μg/kg at Direct-Push Boring B2347S to 6.9 μg/kg at Direct-Push Boring B2333S. Two locations in the seven- to ten-ft bgs interval had PCE concentrations that exceeded the residential KDHE RSK value for soil-to-groundwater protection pathway and three locations were non-detect.

The following direct-push borings had no detection of PCE in samples taken from the seven- to ten-ft bgs depth interval: B2144S, B2183S, B2203S, B2345S, B2350S, and B2429S (Figure 5-7).

- TCE was also detected in all four depth intervals between ground surface and ten-ft bgs, but not at the elevated concentrations detected for PCE (see Figures 5-8 through 5-11). TCE was detected in 12 of 15 direct-push borings at one or more of the sampled depth intervals. For the zero- to one-ft bgs depth interval, TCE detections ranged from 756J μg/kg at Direct-Push Boring B2335S to 16J μg/kg at Direct-Push Boring B2325S. Two locations in the zero- to one-ft bgs interval had TCE concentrations that exceeded the residential KDHE RSK value for the soil-to-groundwater protection pathway of 200 μg/kg and six locations were non-detect. For the one- to four-ft bgs depth interval, TCE concentrations ranged from 733 μg/kg at Direct-Push Boring B2337S to 7.3J μg/kg at Direct-Push Boring B2369S.

Four locations in the one- to four-ft bgs interval had TCE concentrations that exceeded the residential KDHE RSK value for the soil-to-groundwater protection pathway. Three locations were non-detect for TCE in this interval. For the four- to seven-ft bgs depth interval, TCE concentrations ranged from 262 μg/kg at Direct-Push Boring B2337S to 6.7 μg/kg at Direct-Push Boring B2325S. Two locations in the four- to seven-ft bgs interval had TCE concentrations that exceeded the residential KDHE RSK value for the soil-to-groundwater protection pathway, while eight locations were non-detect in this interval. For the seven- to ten-ft bgs depth interval, TCE concentrations ranged from 34.5 μg/kg at Direct-Push Boring B2336S to 19 μg/kg at Direct-Push Boring B2337S.

None of the samples in the seven- to ten-ft bgs interval had TCE concentrations that exceeded the residential KDHE RSK value for the soil-to-groundwater protection pathway. Fourteen locations were non-detect in this interval, including B2144S, B2183S, B2203S, B2322S, B2325S, B2333S, B2335S, B2344S, B2345S, B2350S, B2358S, B2360S, B2369S, B2370S, and B2429S (Figure 5-11).

- cis-1,2-DCE and/or trans-1,2-DCE were detected at 11 of the 15 direct-push borings located east of Building 367 (see Figures 5-12 through 5-15). For the zero- to one-ft bgs depth interval, cis-

1,2-DCE detections ranged from 8,120J µg/kg at Direct-Push Boring B2337S to 7.5J µg/kg at Direct-Push Boring B2345S. Three locations in the zero- to one-ft bgs interval had cis-1,2-DCE concentrations that exceeded the residential KDHE RSK value for the soil-to-groundwater protection pathway of 800 µg/kg and four locations were non-detect. trans-1,2-DCE was detected at five direct-push borings in this interval, at concentrations ranging from 58.4 to 6.4 µg/kg. For the one- to four-ft bgs depth interval, cis-1,2-DCE concentrations ranged from 1,080J µg/kg at Direct-Push Boring B2337S to 9J µg/kg at Direct-Push Boring B2350S. Only one location in the one- to four-ft bgs interval had a cis-1,2-DCE concentration that exceeded the residential KDHE RSK value for the soil-to-groundwater protection pathway. Four locations were non-detect for cis-1,2-DCE in this interval. trans-1,2-DCE was detected at Direct-Push Borings B2336S and B2337S at concentrations of 6.2 µg/kg and 6.9 µg/kg, respectively. For the four- to seven-ft bgs depth interval, cis-1,2-DCE concentrations ranged from 626J µg/kg at Direct-Push Boring B2336S to 27.6 µg/kg at Direct-Push Boring B2322S. None of the detections in this interval exceeded KDHE RSK soil or soil-to-groundwater protection standards (residential). Seven locations were non-detect in this interval. There was a single detection of trans-1,2-DCE at Direct-Push Boring B2336S at a concentration of 6.5 µg/kg.

For the seven- to ten-ft bgs depth interval, cis-1,2-DCE concentrations ranged from 402J µg/kg at Direct-Push Boring B2336S to 6.3 µg/kg at Direct-Push Boring B2325S. None of the samples in the seven- to ten-ft bgs interval had cis-1,2-DCE concentrations that exceeded KDHE RSK soil and soil-to-groundwater protection standards (residential). Nine locations were non-detect in this interval for cis-1,2-DCE (B2144S, B2183S, B2203S, B2333S, B2344S, B2345S, B2350S, B2369S, and B2429S; see Figure 5-15) and there were no detections of trans-1,2-DCE in this interval.

- Acetone was detected at two direct-push borings at concentrations below KDHE RSK soil and soil-to-groundwater protection standards (residential). Both detections were in samples taken from the zero- to one-ft bgs interval. Acetone was detected at Direct-Push Borings B2336S and B2360S at concentrations of 180 µg/kg and 220 µg/kg, respectively.

5.4.1.2 Former Building 354/Building 332/DPW Compound AOI

This section will address the nature and extent of VOC contamination at the Former Building 354/ Building 332/DPW Compound AOI, with emphasis on the results of the following field activities:

- Soil samples collected during the IFI
- Soil sampling for off-site laboratory analysis conducted during the 2001 RI field season

5.4.1.2.1 Former Building 354/Building 332/DPW Compound Soil Sampling - IFI

Figure 3-1 (in this report) provides a very generalized summary of on-site soil-gas results for PCE and TCE collected during the IFI in 1997.

- At the four soil-gas sampling locations located just west of the DPW Compound, PCE was the only contaminant detected. PCE was detected in samples taken from B707 (nine-ft bgs), B707 (15-ft bgs), and B708 (15-ft bgs). Levels ranged from 1.9 μg/L to 0.2 μg/L.

- Soil-gas sampling during the IFI detected widespread PCE contamination in and adjacent to the DPW Compound. PCE was detected in 53 of 71 samples at concentrations ranging from 76.8 μg/L in Direct-Push Boring B-11 (32-ft bgs) to 0.2 μg/L in Direct-Push Boring B-03 (33-ft bgs) (BMcD, 1998a). Smaller areas of TCE contamination were detected, mainly in the vicinity of the former Building 354, and south of Monitoring Well TS0292-01 (Figure 3-1). TCE was detected in 11 of 71 samples at concentrations ranging from 4.2 μg/L in Direct-Push Boring B-21 (29-ft bgs) to 1.0 μg/L in Direct-Push Boring B-86 (34-ft bgs).

5.4.1.2.2 Former Building 354/Building 332/DPW Compound Soil Sampling for Off-Site Laboratory Analysis

Twenty-four direct-push borings were advanced for soil sampling around Building 332 in the DPW Compound at locations based upon analysis of field data collected during the IFI (a discussion of this activity is presented in Section 4.2.1.2 of this report). The direct-push borings will be grouped into three independent sets and include: nine direct-push borings (B150 through B158) located just east of Building 332; six borings (B159 through B164) located west of Building 332 in the vicinity of the old wash rack pad; and the nine borings (B165 through B173) located just south of Building 332 (see Figure 4-6). Analytical results are presented in Tables 5-5 and 5-6. Only one soil sample from these had a VOC detection. This was a detection of PCE at a concentration of 7.5 μg/kg in the zero- to one-ft bgs sample taken at Direct-Push Boring B152 (see Figure 4-6 for locations).

5.4.1.3 Building 430 AOI

This section will address the nature and extent of VOC contamination at the Building 430 AOI, with emphasis on the results of the following field activities:

- The soil-gas survey conducted during the 2001 RI field season
- Soil sampling for off-site laboratory analysis conducted during the 2001 RI field season

5.4.1.3.1 Building 430 On-Site Soil-Gas Survey

A soil-gas survey, with on-site analysis, was performed at Building 430 during June and July 2001 (a discussion of this activity is presented in Section 4.2.1.2 of this report). Soil-gas sampling was conducted at 180 direct-push borings, with samples taken from depths of both nine and 15-ft bgs. Results are presented in Table 5-7, and Figures 5-16 through 5-18. Significant results are presented in the following bullets:

- CCl_4 was detected in soil gas at 95 direct-push borings at the nine-ft bgs depth. This represents 53 percent of the total samples taken at this depth. The maximum detection of 16 μg/L was at Direct-Push Boring B915, located about 30 ft south of Building 430. The main area of CCl_4 soil-gas detections was located in the area to the south and southeast of Building 430 (Figure 5-16). At the 15-ft bgs sampling depth, there were detections of CCl_4 at a total of 36 direct-push borings. This represents 20 percent of the total samples taken at this depth. The highest detection was at Direct-Push Boring B1036 (6.8 μg/L). The results for CCl_4 at 15-ft bgs are presented on Figure 5-17.

- TCE was detected in soil gas at 12 of 180 direct-push boring locations at the nine-ft bgs sampling depth. This represents seven percent of the total samples taken at this depth. The maximum soil-gas detection at this depth was 0.8J μg/L at Direct-Push Borings B924 and B934 (Figure 5-18). At the 15-ft bgs depth, there were only six detections of TCE in soil gas. The maximum detection of TCE at 15-ft bgs was at Direct-Push Boring B901 at a concentration of 0.4J μg/L.

- There were no detections of PCE, cis-1,2- and trans-1,2-DCE, or BTEX in soil gas at Building 430.

5.4.1.3.2 Building 430 Soil Sampling for Off-Site Laboratory Analysis

Soil samples were collected at Building 430 for off-site analysis of VOCs and PAHs from a total of nine direct-push boring locations (Figure 4-6). A discussion of this activity is presented in Section 4.2.1.2 of this report. These samples were collected to provide defensible data for performing the risk analysis and to further delineate contamination at the 354 Site. There were no detections of VOCs in any of these soil samples (Table 5-8).

5.4.1.4 Former Service Station (Dickman Ave) AOI

This section will address the nature and extent of VOC contamination at the former service station AOI, with emphasis on the results of soil samples collected during the 1999/2000 RI field season. Details on these activities were covered in Section 4.2.1.2 of this report.

Chlorinated VOCs were detected in soil samples collected from Direct-Push Borings B132 and B133 (see Figure 4-1 in the DETMWP). Off-site confirmation samples were collected for each of these locations, and chlorinated VOCs were detected in the confirmation sample for Direct-Push Boring B132. All these detections fell below the residential KDHE RSKs for both the soil and soil-to-groundwater protection pathway. The following bullets summarize these detections:

- PCE was detected at a level of 3.2 μg/kg in a soil sample collected from 10-ft bgs at Direct-Push Boring B132 (at the former service station site along Henry Drive).

- PCE was detected below the reporting limit (<2.0 μg/kg) in a soil sample collected from 10-ft bgs at Direct-Push Boring B133 (north of the UPRR station, Building 311). Because this result was detected below the reporting limit for PCE, the value is not considered conclusive.

5.4.1.5 Results from AGL SI

As part of the AGL SI, soil samples were taken along the sanitary sewer that runs just southeast of and parallel to the UPRR grade. Details of this activity are covered in the AGL SI (BMcD, 2002a). There was only one detection of a chlorinated solvent. This was a detection of PCE at a concentration of 3.1J μg/kg at Direct-Push Boring AGL-01-SB100 (this boring was located about 300 ft northeast of the intersection of Marshall Avenue and the UPRR grade; see Figure 4-2). The depth of this soil sample was six- to eight-ft bgs. This detection was below KDHE RSK soil and soil-to-groundwater protection standards (residential).

5.4.1.6 Summary of VOC Contamination in Soil and the Vadose Zone

To summarize chlorinated VOC contamination in subsurface soils:

- The highest chlorinated VOC contamination is present in shallow soils in the area immediately to the east of Building 367. PCE is the primary contaminant, with lesser concentrations of TCE and cis-1,2-DCE. Concentrations of PCE as high as 29,000 μg/kg have been detected in this area. Off-site analytical data indicates that the highest concentrations of soil contamination are present between the ground surface and four ft bgs in virtually all direct-push borings. These concentrations drop as the ten-ft bgs depth is approached. At the seven to ten-ft bgs depth, chlorinated VOC concentrations are either below or rapidly approaching the KDHE RSK values for the soil-to-groundwater protection pathway.

- Some chlorinated solvent contamination in soil has been detected in the vicinity of former Building 354/Building 332/DPW Compound; however, concentrations were all below regulatory standards.

- Although CCl_4 was detected in soil gas (at low concentrations) in the vicinity of Building 430, VOCs were not detected in any soil samples collected in this area.

- Contamination of soils at depth (within a few feet of the overburden-bedrock interface) is probably the result of lateral transport of contaminated groundwater, combined with vertical fluctuations in water table elevation.

5.4.2 Semivolatile Organic Compounds

The following discussion will address the nature and extent of SVOC contamination across the 354 Site. The Building 367 AOI will be discussed first, followed by the former Building 354/Building 332/DPW Compound AOI, and Building 430 AOI, and the Former Service Station (Dickman Ave) AOI. PAHs will be discussed in this section, recognizing that petroleum products (discussed in Section 5.4.3) are commonly a source of these compounds and that this may be the situation at the 354 Site.

5.4.2.1 Building 367 AOI

As previously discussed, 18 direct-push soil borings were advanced in the vicinity of Building 367 for the purpose of collecting soil samples for off-site laboratory analysis. Three of these direct-push borings were located to the west of Building 367 and 15 were located to the east of the building (Figure 4-6). SVOC analytical results are presented in Tables 5-3 and 5-4.

To the west of Building 367, there were detections of PAHs at both Direct-Push Borings B2144S and B2203S. At Direct-Push Boring B2144S, there were detections of benzo(g,h,i)perylene, chrysene, and phenanthrene. Direct-Push Boring B2203S had detections of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. All of these detections were at concentrations below KDHE RSK soil and soil-to-groundwater protection standards (residential).

To the east of Building 367, there were detections of PAHs at all 15 direct-push borings. Most detections were in the two shallow sampling intervals, between 0- to 4-ft bgs. PAHs detected included benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene. All detections were below KDHE RSK soil and soil-to-groundwater protection standards (residential).

5.4.2.2 Former Building 354/Building 332/DPW Compound AOI

Twenty-four direct-push borings were advanced for soil sampling in the vicinity of the former Building 354; this area also includes Building 332 and the DPW Compound. These borings will be addressed as three independent sets in the following discussion and include: nine direct-push borings (B150 through B158) located just east of Building 332; six borings (B159 through B164) located west of Building 332 in the vicinity of the old wash rack pad; and nine borings (B165 through B173) located just south of Building 332 (Figure 4-6).

Six of the nine direct-push borings from the B150 through B158 group (east of Building 332) had low level detections of PAHs at sampling depths ranging from ground surface to four-ft bgs. These included Direct-Push Borings B152S, B153S, B154S, B155S, B157S, and B158S. PAHs detected included benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, ideno(1,2,3-cd)pyrene, phenanthrene, and pyrene. None of these detections exceeded KDHE RSK soil and soil-to-groundwater protection standards (residential) for these compounds. Analytical results are presented in Table 5-5.

Three of the six direct-push borings in the B159 through B164 group (wash pad) had detections of PAHs at sampling depths ranging from ground surface to ten-ft bgs. These included Direct-Push Borings B161, B163, and B164. PAHs detected at low levels in this group of borings included benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, dibenz(a,h)anthracene, ideno(1,2,3-cd)pyrene, phenanthrene, and pyrene. None of these detections exceeded KDHE RSK soil and soil-to-groundwater protection standards (residential). There were no detections of any VOCs in these soil samples. Analytical results are presented in Table 5-5.

Seven of the nine direct-push borings in the B165 through B173 group (southwest of Building 332) had detections of PAHs at depths ranging from ground surface to 30-ft bgs. PAHs detected at low concentrations included anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, ideno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene. None of these detections exceeded KDHE RSK soil and soil-to-groundwater protection standards (residential). Analytical results are presented in Tables 5-5 and 5-6.

5.4.2.3 Building 430 AOI

Soil samples were collected at Building 430 for off-site analysis of PAHs from a total of nine direct-push boring locations (Figure 4-6). These samples were collected to provide defensible data for performing the risk assessment and to further delineate contamination at the 354 Site. There were detections of PAHs at concentrations below KDHE RSK soil and soil-to-groundwater protection standards (residential). PAHs detected included benzo(a)anthracene, benzo(a) pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, ideno(1,2,3-cd)pyrene, phenanthrene, and pyrene. Analytical results are presented in Table 5-8.

5.4.2.4 Summary of SVOC Contamination

PAHs were the only SVOCs detected in soils at the 354 Site. All detections were at concentrations below the residential KDHE RSK standards for both the soil and the soil-to-groundwater protection pathway.

5.4.3 Petroleum Products

BTEX and TPH were detected in soil samples collected from four areas. These were the former Building 354 area, in the vicinity of the former service station located along Dickman Avenue, the Building 367 area, and along the sanitary sewer running parallel to the UPRR grade (AGL SI). Each of these areas will be discussed below.

During the IFI in 1997, benzene was detected at three direct-push borings located at and to the south of the former Building 354 location. At two of these direct-push borings (T-5 and T-9), benzene concentrations in soil exceeded the residential KDHE RSK for the soil-to-groundwater pathway (80 μg/kg). Benzene was detected at 2,899 μg/kg at Direct-Push Boring T-5 (former Building 354 site) and at 335 μg/kg at Direct-Push Boring T-9 (south of the DPW Compound fence; see Figure 4-2 in the DETMWP). The soil samples at both borings were collected within a few feet of the terrace alluvium – bedrock interface.

There were detections of BTEX at Direct-Push Boring B172 in samples collected from 21- to 21.5-ft bgs and 29.5- to 30-ft bgs. This boring is located immediately south of the former Building 354 location (Figure 4-6). The analytical results for samples collected from 21- to 21.5-ft bgs depth were rejected during validation. The following bullets summarize detections in the samples taken from the 29.5- to 30-ft bgs depth (see Table 5-6):

- Benzene was detected at a concentration of 124J μg/kg. This exceeded the residential KDHE RSK value of 80 μg/kg for the soil-to-groundwater protection pathway.
- Toluene was detected at a concentration of 139J μg/kg. This is below the residential KDHE RSK value of 40,000 μg/kg for the soil-to-groundwater protection pathway.
- Ethylbenzene was detected at a concentration of 7,400J μg/kg. This is below the residential KDHE RSK value of 55,000 μg/kg for the soil-to-groundwater protection pathway.
- m,p-Xylenes and o-xylenes were detected at concentrations of 29,700J μg/kg and 190J μg/kg, respectively. This was also below the residential KDHE RSK value of 700,000 μg/kg (total xylenes) for the soil-to-groundwater protection pathway.

BTEX was detected in soil samples collected from Direct-Push Boring B132. This boring was located at the site of the former service station, just to the northwest of the UPRR station (Building 311; see Figure 4-1 in the DETMWP). All of the detections were below KDHE RSK soil and soil-to-groundwater protection standards (residential).

- Benzene was detected at a level below the reporting limit (<5.0 μg/kg). The corresponding off-site laboratory confirmation sample was non-detect for benzene.
- Toluene was detected at a concentration of 53.1 μg/kg; however, the corresponding off-site laboratory confirmation sample was non-detect for toluene.
- Ethylbenzene was detected at a concentration of 84.7 μg/kg. The corresponding off-site laboratory confirmation sample detected ethylbenzene at a level of 190 μg/kg.
- m,p-Xylenes were detected at a concentration of 94.5 μg/kg. The corresponding off-site laboratory confirmation sample detected m,p-xylenes at 170 μg/kg.

During the AGL SI, ethylbenzene and xylenes were detected in soil samples taken from Direct-Push Boring AGL-01-SB107. Ethylbenzene was detected at a concentration of 4.1J μg/kg and xylenes were detected at a concentration of 15.1J μg/kg. These results were determined through on-site analysis. In addition, TEPH was detected in three direct-push borings (AGL-01-SB93, AGL-01-SB98, and AGL-01-

SB112) at concentrations ranging from 7.7J µg/kg to 8.9J µg/kg. These results were from off-site laboratory analysis. TVPH was detected in soil from Direct-Push Boring AGL-01-SB107 at a concentration of 155 µg/kg (on-site analysis). These locations are depicted on Figure 4-2 in the AGL SI (BMcD, 2002a). All of these detections fell below the residential KDHE RSK for both the soil and the soil-to-groundwater protection pathways.

There was a detection of BTEX at Direct-Push Boring B2144S, located west of Building 367 (Figure 4-6). m,p-Xylene was detected at a concentration of 6.4J µg/kg (zero- to one-ft bgs), below KDHE RSK soil and soil-to-groundwater protection standards (residential).

In summary, BTEX compounds have been detected at several locations at the 354 Site. Only benzene has been detected at concentrations which exceeded KDHE RSK soil and soil-to-groundwater protection standards (residential). These detections were located near the site of the former Building 354.

5.5 GROUNDWATER CONTAMINATION

This section will address the nature and extent of contamination in the groundwater at the 354 Site. This discussion will primarily evaluate the results of the periodic groundwater sampling events which have been conducted since September 1997. This section will address VOCs (including detailed discussion of the primary COPCs; PCE, TCE, cis-1,2-DCE, and CCl_4), petroleum compounds (including BTEX), SVOCs, and metals. The section will conclude with an overview of groundwater contamination trends.

With the exception of the groundwater sampling conducted in September 1997, which is reported in the IFIR, all groundwater sampling events were reported in detail in DSRs. Interim groundwater sampling events were conducted in November 1998, February 2000, July 2000, October 2000, and March 2001 (BMcD, 1999b; BMcD, 2000a; BMcD, 2000b; BMcD, 2000c; and BMcD, 2001c). Four RI sampling events were conducted in October 2001, January 2002, April 2002, and July 2002 (BMcD, 2001d; BMcD, 2002b; BMcD, 2002c; and BMcD, 2002d). Groundwater data summary tables are provided in this report as Table 5-9a through 5-9jj. Samples were analyzed for TCL VOCs and SVOCs (Tables 4-2 and 4-3). The four RI sampling events also included the addition of natural attenuation parameters (including methane, ethane, ethene, alkalinity, chloride, nitrate, sulfate, sulfide, and TOC), and RCRA metals. Water quality parameters were also analyzed at selected monitoring wells during the October 2001 event. These data are presented in Table 4-4.

As discussed previously (Section 3.5), the off-site analytical data (groundwater samples) from the IFI was suspect due to complications within the laboratory that performed the analyses (Intertek Testing Services). These analytical results will be described, but this data was not used in the risk assessment.

Groundwater screening activities were conducted during the 1999/2000 RI field season. These activities were conducted in order to determine the locations for permanent monitoring wells, and were described in detail in the DETMWP. These activities will not be reviewed further in this report. As discussed previously in Section 4 of this RI Report, additional groundwater screening activities were conducted at the 354 Site during May and June 2001. Sampling locations are presented on Figure 4-1, and were used to fill data gaps and provide information to confirm final monitoring well locations. Ninety-nine direct-push borings were advanced to refusal in an attempt to collect groundwater samples for on-site GC analysis for PCE, TCE, cis-1,2-DCE, CCl_4, and BTEX. Thirty-eight of these borings were dry. Of the remaining 61 borings which yielded some water, there were only five with detections of either CCl_4 or PCE (Table 5-10). Details of these five detections will be presented in the appropriate sections below.

Figures 5-19 through 5-23 present the distribution of PCE, TCE, cis-1,2-DCE, CCl_4, and chloroform in groundwater. These figures do not attempt to delineate the nature of groundwater contamination with respect to different depth zones within the Kansas River alluvial aquifer. The reasons for this are twofold. First, extensive direct-push groundwater sampling conducted during the initial phase of the RI fieldwork provided sufficient field data to allow for a detailed delineation of contamination with depth. Figures 4-10, 4-12, and 4-14 from the DETMWP depict this for PCE, TCE, and cis-1,2-DCE, respectively. This data was used to select the locations for additional monitoring well coverage across the point bar. This monitoring well network, while providing good coverage, does not provide a dense data set that allows for detailed delineation of the nature and extent of the contamination with depth. The second reason for presenting all data on a single figure for each analyte is that the range of concentrations are so minor that little interpretive value would be gained by making individual presentations for multiple depths. Therefore, the decision was made to present the groundwater data set for each analyte on a single figure.

5.5.1 Volatile Organic Compounds

The following VOCs are considered as COPCs for groundwater at the 354 Site: PCE and related compounds (TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE, and VC), 1,2-DCA, CCl_4 and related compounds (trichloromethane, dichloromethane, and chloromethane), and BTEX petroleum constituents. The following discussion of VOCs will concentrate on PCE, TCE, cis-1,2-DCE, and CCl_4, since these are the high interest chlorinated solvents.

VOC contamination follows the general direction of groundwater flow off the alluvial terrace onto the modern floodplain of the Kansas River. The plume originates in the vicinity of Building 367 (the presumed source) and runs south to the UPRR grade. Once the plume impinges on the alluvial aquifer of the Kansas River, it becomes more diffuse and trends in an easterly direction. PCE and TCE predominate as contaminants in the terrace aquifer, while cis-1,2-DCE is more widespread in the Kansas River alluvial aquifer.

5.5.1.1 PCE

The distribution of PCE, based on data from the RI groundwater sampling events, is depicted on Figure 5-19. The following bullets describe the general nature and extent of PCE at the 354 Site:

- The PCE contaminant plume appears to originate in the vicinity of Building 367. Monitoring Well B354-99-08, located immediately east of this building, has had the highest detections of PCE at the study area. This monitoring well was first sampled in February 2000, with a PCE concentration of 4,630 μg/L. The PCE concentration decreased over the next two years to a concentration of 404 μg/L in July 2002 (see Table 5-9g and Figure 5-19). All detected concentrations of PCE at this monitoring well have been two to three orders of magnitude greater than the USEPA MCL of 5.0 μg/L.

- The PCE plume extends south from the vicinity of Building 367 to the area just south of the UPRR grade. Monitoring wells with detections of PCE through this area include (from north to south) Monitoring Wells B354-01-27, B354-99-07, B354-99-09, MW95-06, TS0292-01, and B354-01-25. Overall, average PCE values show a decreasing trend toward the south, with Monitoring Well B354-01-27 having an average PCE concentration of 183 μg/L (four events) and Monitoring Well TS0292-01 having an average concentration of 48 μg/L (nine events). Individually, concentration trends remained steady at Monitoring Wells B354-01-27 and MW95-06, have decreased at Monitoring Wells B354-99-09 and TS0292-01, and have increased slightly at Monitoring Well B354-99-07 (Table 5-9). All detected concentrations of PCE at these wells have been one or two orders of magnitude in excess of the USEPA MCL value. Detections at Monitoring Well B354-01-25 have ranged between 4.2 μg/L and 1.3 μg/L, which are below the MCL. Piezometer PZ-B had a single detection of PCE in November 1998 at a concentration of 2.1 μg/L. This monitoring well has not been sampled since because of a lack of water.

- Once into the Kansas River alluvial aquifer, the PCE plume remains along the northern margin of the alluvial floodplain. It does not extend to the south and east, towards the Kansas River.

Monitoring wells with detections of PCE in this area include Monitoring Well MW95-04, and Piezometers PZ-C, and PZ-D. At these three sampling points, average PCE values ranged from 6.0 μg/L at Piezometer PZ-C to 3.6 μg/L at Monitoring Well MW95-04, with maximum concentrations of 9.7 μg/L (PZ-D) and 9.6 μg/L (MW95-04). Trends at these wells were steady over the sampling interval, with the exception of PZ-D, which showed a slight increase in PCE concentration over the sampling period. Monitoring Well MW95-04 and Piezometers PZ-C and PZ-D had more than one detection of PCE at concentrations below the USEPA MCL of 5.0 μg/L. Monitoring Well B354-00-PZ14c had a single detection of PCE at a concentration of 1.2 μg/L during the January 2002 sampling event.

- During the 2001 RI fieldwork direct-push groundwater screening, there was a single detection of PCE at Direct-Push Boring B1412 (3.7 μg/L). This boring was located in the swale just west of Building 310 (see Figure 4-1). This area is along the western margin of the chlorinated solvent plume, and a detection of PCE in this area is not unexpected.

- An outlier of PCE contamination was detected at Direct-Push Boring C8, on the extreme eastern edge of the study area along the Kansas River (Figure 4-10 in the DETMWP). PCE detections here ranged from 3.0 μg/L in the shallow zone to 6.0 μg/L in the deep zone. Two days later this location was resampled and there was no PCE detected in either on-site GC results or in confirmation sample sent to the off-site lab. This location was resampled in October 2001 as part of the AGL investigation. There were no detections of any chlorinated solvents at that time (BMcD, 2002a). The initial detections were probably false positives, rather than actual detections of PCE.

5.5.1.2 TCE

The distribution of TCE, based on data from the RI groundwater sampling events, is depicted on Figure 5-20. The following bullets describe the general nature and extent of TCE at the 354 Site:

- As was the case with the PCE plume, the TCE contamination also appears to originate in the vicinity of Building 367 (see Figure 5-20). TCE concentrations ranged from 160 μg/L (February 2000) to 24 μg/L (April 2002) at Monitoring Well B354-99-08, which represents a decreasing concentration trend over this period. All detections at this monitoring well were in excess of the USEPA MCL of 5.0 μg/L.

- TCE concentrations decrease dramatically to the south of the Building 367 source area. Detections at Monitoring Wells B354-01-27, B354-99-07, B354-99-09, MW95-06, and TS0292-01 have all been at concentrations below the MCL of 5.0 μg/L. Based on non-detections at Monitoring Wells B354-01-25 and TS0292-02, and Piezometer PZ-C, it appears this segment of the plume ends just to the north of the UPRR grade (see Figure 5-20).

- TCE is present in the Kansas River alluvial aquifer, but at very low concentrations. TCE has been detected in 75 percent or more of sampling events at Monitoring Wells B354-99-12, B354-99-12b, B354-99-12c, and B354-01-29c. Concentrations have ranged from a high of 1.9 μg/L at Monitoring Well B354-99-12c to non-detect (at multiple wells). This is below the USEPA MCL for TCE of 5.0 μg/L. There have also been sporadic detections of TCE at Monitoring Wells MW95-03, MW95-04, B354-01-20c, and Piezometers PZ-A and PZ-D. Although the differences are slight, it appears that TCE concentrations may be higher in the deeper zone of the Kansas River alluvial aquifer. For example, this is true for Monitoring Wells MW95-03 and B354-01-29c (see Tables 5-9c and 5-9y).

5.5.1.3 cis-1,2-DCE

The distribution of cis-1,2-DCE, based on data from the RI groundwater sampling events, is depicted on Figure 5-21. The following bullets describe the general nature and extent of cis-1,2-DCE at the 354 Site:

- cis-1,2-DCE is present in two discontinuous areas on the terrace (see Figure 5-21). The first area of cis-1,2-DCE contamination is in the vicinity of Building 367, with detections at Monitoring Wells B354-99-08 and B354-01-27. Monitoring Well B354-99-08 had detections of cis-1,2-DCE at concentrations ranging from 260 μg/L (February 2000) to 41 μg/L (October 2000). Six of the eight samples taken from Monitoring Well B354-99-08 between February 2000 and July 2002 exceeded the USEPA MCL of 70 μg/L for cis-1,2-DCE. Monitoring Well B354-01-27 had detections of cis-1,2-DCE during all four RI groundwater sampling events, but at concentrations that did not exceed 1.0 μg/L (see Table 5-9w).

  The second area of cis-1,2-DCE contamination located on the terrace is south of Building 332 in the vicinity of Monitoring Wells TS0292-01 and TS0292-02. cis-1,2-DCE concentrations at Monitoring Well TS0292-02 ranged from 21.8 μg/L to 7.7 μg/L and were generally steady over the five year period that samples were collected. At Monitoring Well TS0292-01, cis-1,2-DCE concentrations never exceeded 2.0 μg/L. Other areas on the terrace have occasionally had detections of cis-1,2-DCE and include Monitoring Wells MW95-06 and B354-99-07; however, these did not exceed 1.0 μg/L. These samples were all below the USEPA MCL of 70 μg/L.

- An area of cis-1,2-DCE contamination is present within the Kansas River alluvial aquifer; however, concentrations are generally less than 5.0 μg/L. The plume extends generally from the vicinity of the horse corral east to the Kansas River (Figure 5-21). The following eleven monitoring wells installed in the Kansas River alluvial aquifer have had detections of cis-1,2-DCE during at least 75 percent of the groundwater sampling events: B354-99-12, B354-99-12b, B354-99-12c, B354-99-13b, B354-99-13c, B354-00-PZ20, B354-01-20c, B354-01-29c, B354-01-30c, MPL94-01, and MPL94-02. Detections of cis-1,2-DCE at these monitoring wells has ranged from a high of 8.4 μg/L (at Monitoring Well B354-99-12b) to non-detect (at multiple wells). This range of concentrations is below the USEPA MCL of 70 μg/L. At these low concentrations it is not possible to discern any meaningful concentration trends (increasing or decreasing) at these monitoring wells. In addition, the following six monitoring wells have had occasional detections of cis-1,2-DCE: MW95-03, PZ-A, and MPL94-03. None of these detections have exceeded 7.0 μg/L.

- As part of the AGL SI, groundwater samples were taken at three locations by direct-push methods. Two of these locations were on the east side of the Kansas River, one of which had low level detections of cis-1,2-DCE. Water samples were collected at three intervals (shallow, intermediate, and deep depths) within the Kansas River alluvial aquifer. cis-1,2-DCE was detected in the shallow sample at a concentration of 1.2J μg/L and in the deep sample at a concentration of 1.3J μg/L (see Figure 4-2). These values were below the MCL for cis-1,2-DCE.

5.5.1.4 Carbon Tetrachloride

The distribution of CCl_4 and chloroform (trichloromethane), based on data from the RI groundwater sampling events, is depicted on Figures 5-22 and 5-23. Trichloromethane is a reductive dechlorination byproduct from the biodegradation of CCl_4 and may be related to the CCl_4 contaminant. The following bullets describe the general nature and extent of CCl_4 and chloroform at the 354 Site:

- At the 354 Site, most detections of CCl_4 and chloroform have been in the terrace aquifer. The principle area of CCl_4 contamination extends from the vicinity of Building 367 south to the vicinity of former Building 354 (Figure 5-22). The monitoring wells with the highest detections of carbon tetrachloride in this area include Monitoring Wells MW95-06 (detection of 5.3 μg/L in

November 1998) and B354-99-08 (detection of 3.8 µg/L in July 2002). The November 1998 detection at Monitoring Well MW95-06 is the only one over the USEPA MCL of 5.0 µg/L for CCl_4. Other monitoring wells in this area that have routinely had detections of CCl_4 include Monitoring Wells TS0292-01, B354-99-07, B354-99-09, and B354-01-27. These detections have been below the USEPA MCL. The area in vicinity of Building 430 (Godfrey Ave. fire station) has also had detections of CCl_4. Detections of CCl_4 at Monitoring Well B354-01-26 have ranged from 3.8 µg/L to 1.9 µg/L.

- There have been occasional detections of carbon tetrachloride in samples collected from monitoring wells completed in the Kansas River alluvial aquifer. These detections have occurred at Monitoring Well MW95-04 and Piezometer PZ-D, and have not exceeded 1.6 µg/L.

- During the additional groundwater screening conducted during the 2001 RI field season, there were four detections of CCl_4 in the area both north and south of Building 430 (see Figure 4-1). Only one of these exceeded the reporting limit of 2.0 µg/L for the field GC. This was at Direct-Push Boring B777A, with a concentration of 5.1 µg/L. There were three detections of CCl_4 between the reporting and detection limits. These were at Direct-Push Borings B768 (1.6J µg/L), B790 (0.3J µg/L), and B820 (0.6J µg/L).

- Chloroform was detected at virtually all monitoring wells that had detections of carbon tetrachloride (Figure 5-23). Concentrations of chloroform in these monitoring wells did not exceed 2.2 µg/L, which is below the USEPA MCL of 100 µg/L. In addition, Monitoring Well B354-00-10, which does not have a history of carbon tetrachloride detections, had a single detection of chloroform during the July 2002 sampling event, at a concentration of 0.7 µg/L.

5.5.1.5 Other VOCs

Other VOCs detected during groundwater monitoring at the 354 Site (excluding BTEX, which will be discussed below in Section 5.5.2) include: 1,1,2-trichloroethane, bromodichloromethane, carbon disulfide, dibromochloromethane, trans-1,2-DCE, and VC. These compounds will be addressed in turn in the following bullets:

- 1,1,2-Trichloroethane was detected at Monitoring Well B354-99-08 during the March 2001 sampling event at a concentration of 0.7 µg/L. This detection was below the USEPA MCL of 5.0 µg/L.

- Bromodichloromethane and dibromochloromethane were detected at Monitoring Well MW95-04 during the October 2001 sampling event at concentrations of 0.7 μg/L and 0.9 μg/L, respectively. These concentrations are below the USEPA MCL of 100 μg/L for total trihalomethanes.

- Carbon disulfide was detected at Monitoring Well B354-00-10 during the February 2000 sampling event at a concentration of 7.2 μg/L. Carbon disulfide does not currently have a USEPA MCL; however, the KDHE RSK value for the groundwater protection pathway (residential) is 9.0 μg/L.

- trans-1,2-DCE has been detected during more than one sampling events at Monitoring Wells TS0292-02, B354-99-08, B354-99-12b, B354-99-12c, and PZ-A. These detections have not exceeded 2.0 μg/L, which is below the USEPA MCL of 100 μg/L for that compound.

- VC was detected during three sampling events at Monitoring Well B354-00-10. Only one detection (2.5 μg/L in July 2000) exceeded the USEPA MCL of 2.0 μg/L for that compound. The other two detections, during February and October 2000, were both less than 1.0 μg/L.

5.5.2 Petroleum Compounds

BTEX compounds have been detected at the 354 Site, mainly in the area at and to the south of the former Building 354 site and the DPW Compound. These compounds are addressed in the following bullets:

- Benzene has been detected at four monitoring wells at the 354 Site: TS0292-01, TS0292-02, MW95-03, and B354-01-25. Monitoring Well TS0292-02 has had consistent detections of benzene at concentrations ranging from 40.3 μg/L to 14.6 μg/L, above the USEPA MCL of 5.0 μg/L. It appears that there has been a slight increase in benzene concentration at this monitoring well over the last five years. Monitoring Well TS0292-01 has had detections of benzene during seven of nine sampling events, with concentrations not exceeding 4.2 μg/L. There have been single detections of benzene at both Monitoring Wells MW95-03 and B354-01-25 (1.0 and 0.4 μg/L, respectively).

- Toluene has been routinely detected at both Monitoring Wells TS0292-01 and TS0292-02 at very low concentrations, not exceeding 2.7 μg/L. This is below the USEPA MCL of 1,000 μg/L.

- Ethylbenzene has been detected at both Monitoring Wells TS0292-01 and TS0292-02 at low concentrations not exceeding 8.5 μg/L. This is below the USEPA MCL of 700 μg/L for this compound.

- Xylenes have been detected at both Monitoring Wells TS0292-01 and TS0292-02 at concentrations not exceeding 13.6 μg/L (total xylenes). This is below the USEPA MCL of 10,000 μg/L (total xylenes) for this compound.

5.5.3 Semivolatile Organic Compounds

There were only three SVOCs detections during the groundwater sampling events. bis(2-Ethylhexyl)phthalate (a common lab contaminant) was detected at Monitoring Well TS0292-01 at a concentration of 19 μg/L in January 2002. This compound was also detected at Monitoring Well B354-99-09 at a concentration of 63 μg/L in July 2002. These concentrations both exceeded the USEPA MCL of 6.0 μg/L for that compound. A review of QA/QC validation results suggests that both of these are valid field detections and are not the result of lab contamination. Diethyl phthalate was detected at Monitoring Well MPL94-01 at a concentration of 7.3J μg/L in September 1997. There is no USEPA MCL for diethyl phthalate; however, the KDHE RSK value for the groundwater protection pathway (residential) is 12,000 μg/L.

5.5.4 Overall Trends

Currently, a detailed analysis of overall trends for critical monitoring wells at the 354 Site cannot be assessed based on the lack of long term analytical data. However, some observations based on the existing data sets can be presented and are as follows:

- Monitoring Well B354-99-08 has had a significant drop in the concentration of PCE since it was first sampled in February 2000. At that time, PCE was detected at a concentration over 4,600 μg/L. This concentration has fallen to below 1,000 μg/L over the last three sampling rounds, with the two most recent (April and July 2002) having concentrations below 500 μg/L. TCE and cis-1,2-DCE concentrations have remained fairly stable over this period.

- Three monitoring wells located downgradient from Monitoring Well B354-99-08 have displayed varied degrees of PCE concentrations. Monitoring Well B354-01-27, located immediately downgradient from Monitoring Well B354-99-08, has shown fairly steady PCE concentrations (based on only four sampling rounds). However, Monitoring Well B354-99-07 has shown a slight increase in PCE concentrations, while Monitoring Well B354-99-09 has shown a significant decrease in PCE (from almost 100 µg/L [July 2000] to about slightly less than 30 µg/L [July 2002]). TCE and cis-1,2-DCE concentrations at these monitoring wells are so low that significant trends could not be determined.

- Concentrations of PCE in Monitoring Well MW95-06 have remained essentially steady since late 1997.

- Concentrations of PCE in Monitoring Well TS0292-01 have shown a decrease since 2000. The BTEX components have also seen decreases over the same time period; although, these have only been detected at low levels.

- Concentrations of cis-1,2-DCE in Monitoring Well TS0292-02 have also remained steady at concentrations generally between 10 µg/L and 22 µg/L since late 1997.

- Concentrations of COPCs from monitoring wells located in the Kansas River alluvial aquifer appear to be fairly steady. Many of these detections are low, so it is difficult to draw firm conclusions on increasing or decreasing trends in many cases.

5.6 SURFACE WATER

Surface-water samples have been collected from the Kansas River by the USGS in March 2000, July 2000, and July 2001. Ten samples were collected on each transect and all samples were analyzed for VOCs. The sample locations and collection methods are presented in the QCSRs/QCTMs for the events (see figures in BMcD, 2000d; BMcD, 2000e; and BMcD, 2001e). There were no detections of VOCs during these surface-water sampling events.

5.7 SUMMARY

Chlorinated solvent and BTEX contamination is present in both soil and groundwater at the 354 Site. Selected metals were detected at levels exceeding regional and local background in soil and groundwater. The following bullets summarize significant soil results from the nature and extent discussion:

- Significant chlorinated solvent contamination in soils is concentrated primarily in the vicinity of Building 367. PCE is the main compound present in shallow soils, with detected concentrations as high as 29,000 µg/kg (B2335S from one- to four-ft bgs; see Figure 5-5). TCE and cis-1,2-

DCE were also detected in soils in this area. Chlorinated solvents were not detected in soil samples taken from the vicinity of Building 430; however, there were very low level detections of CCl_4 and TCE in soil-gas samples taken from this area. Low levels of PCE and TCE were also detected in soil samples collected in the vicinity of former Building 354/Building 332/DPW Compound.

- There were no PAHs detected at concentrations in excess of KDHE RSK values. SVOCs were not present in soils in significant concentrations.

- Petroleum compounds were detected in soil samples collected from the vicinity of former Building 354, in vicinity of the former service station along Dickman Avenue, west of Building 367, and along the sanitary sewer that runs parallel to the UPRR grade. Benzene was detected at concentrations in excess of residential KDHE RSK values.

- Only lead was detected in soil at concentrations which exceeded the regional background values; however, these concentrations were below regulatory standards. Arsenic, barium, cadmium, and chromium were also detected in soil, but at levels below both background and regulatory standards.

The following bullets summarize significant groundwater and surface-water results:

- PCE, TCE, and cis-1,2-DCE were present in groundwater, both within the terrace and Kansas River alluvial aquifers (Figure 5-24). PCE has been detected in groundwater at concentrations in excess of 4,000 μg/L initially in samples collected from Monitoring Well B354-99-08, located just east of Building 367. Concentrations at this monitoring well have been decreasing since the initial sampling event. This monitoring well is located within the area with the highest levels of PCE contamination in soil. PCE concentrations within the terrace aquifer tend to be elevated above the USEPA MCL of 5.0 μg/L, but drop to not detectable once the plume enters the Kansas River alluvial aquifer. TCE and cis-1,2-DCE are also elevated within the terrace plume, then decrease upon entering the alluvium.

- CCl_4 has been detected within the terrace aquifer, with some of these detections exceeding the MCL. There were also sparse detections of CCl_4 within the Kansas River alluvial aquifer (Figure 5-22).

- Petroleum compounds have been detected in groundwater, mainly at Monitoring Wells TS0292-01 and TS0292-02. Benzene has been detected at Monitoring Well TS0292-02 at concentrations above USEPA MCLs.

- Arsenic, barium, chromium, lead, and mercury were detected in groundwater samples. Only arsenic and lead were present at concentrations which exceeded USEPA MCLs or action levels. Arsenic was also present in concentrations that exceeded the local background values (as determined for FFTA-MAAF). Only one lead detection exceeded background.

- Although cis-1,2-DCE has been detected at very low concentrations at monitoring wells immediately adjacent to the Kansas River, there have been no detections of COPCs in surface water samples collected from the river.

* * * * * *

6.0 FATE AND TRANSPORT EVALUATION

6.1 INTRODUCTION

The purpose of this section is to provide a detailed discussion of contaminant fate and transport at the 354 Site. This section will consist of the following subsections:

- Section 6.2 will describe fate and transport mechanisms which could be impacting contaminant distribution and mass at the 354 Site.
- Section 6.3 will evaluate fate and transport mechanisms with regard to the 354 Site. Non-destructive mechanisms will be addressed (Section 6.3.1), followed by destructive mechanisms (Section 6.3.2). The latter subsection will include a detailed evaluation of NA processes at the 354 Site.
- Section 6.4 will present the conceptual site model for the 354 Site.

Quantitative fate and transport models can be used to predict the movement of chemicals through soil and groundwater over time. These models might be necessary for predicting chemical concentrations at receptor points away from the source as a result of chemical migration or media transfer. It was determined during development of the RI/FS WP that fate and transport modeling would be performed only if quantitative estimates of future concentrations were deemed necessary and/or if the conceptual model cannot be confirmed with existing data. Based on information collected during the RI, fate and transport models were not required for completion of this report and will not be discussed further.

6.2 FATE AND TRANSPORT MECHANISMS

Contaminant transport mechanisms include advection, diffusion, dispersion, adsorption, volatilization, and biodegradation (Bedient, Rifai, and Newell, 1994). These are briefly discussed in the following bullets:

- Advection is the process whereby contaminants advance with the flowing groundwater at the seepage velocity in the porous media.

- Diffusion is mass transport at the molecular level in which solutes move from areas of higher concentration to areas of lower concentration. Since this process occurs on a molecular scale and is important only in environments with either very low groundwater velocities or stagnate conditions (not present at the 354 Site), the diffusion contaminant transport mechanism will not be discussed further in this section.

- Dispersion is the process of mixing caused by velocity variations within the porous media, resulting in the lateral spreading of sharp plume fronts and the dilution of contaminant concentrations at the margins of the plume.

- Adsorption is the partitioning of organic contaminants from the soluble phase onto the soil matrix. This can result in the retardation of the fronts of contaminant plumes and a loss of mass from the aqueous phase.

- Volatilization is the process of liquid or solid phase evaporation that occurs when contaminants present either as nonaqueous phase liquids or dissolved in water contact a gas phase (Domenico & Schwartz, 1990).

- Biodegradation is the chemical transformation of certain organic compounds (especially chlorinated solvents) to carbon dioxide and water through the intervention of microbes in the subsurface. This will be described in more detail below in Section 6.3

Processes that result in the reduction in contaminant concentration, but do not result in a decrease in total mass of the compound, are referred to as nondestructive. Advection, diffusion, dispersion, adsorption, and volatilization are examples of nondestructive contaminant transport processes. Destructive processes result in the reduction of total contaminant mass, usually by transforming the contaminant to other compounds. Biodegradation is an example of a destructive process.

As stated previously, NA of contaminants includes both destructive and nondestructive processes. In discussions to follow, the collection and evaluation of NA parameters will be addressed. This evaluation will focus on those physical and chemical characteristics that will allow for the determination of either a favorable or unfavorable environment for NA.

Regardless of the mechanisms responsible for the reduction and removal of chlorinated compounds from both the terrace and the Kansas River alluvial aquifers, it is apparent from isoconcentration plots that these processes are having an impact (see Figures 5-19 through 5-23).

6.3 EVALUATION OF FATE AND TRANSPORT MECHANISMS

6.3.1 Non-Destructive Mechanisms

Advection/dispersion and adsorption are probably the most significant nondestructive fate and transport mechanisms active at the 354 Site. Volatilization may play a secondary role in the fate of chlorinated solvents.

Advection/Dispersion

Advection/dispersion is evaluated here by relying on both the groundwater gradient and porous media hydraulic conductivity information provided in Section 2.5.2 of this report. This provides information on both the direction and velocity with which contaminants are moving through the aquifer(s).

On the alluvial terrace, to the north of the UPRR grade, the direction of groundwater flow is generally in a south-southeasterly direction based on equipotential lines on the groundwater elevation maps (Figures 2-9 through 2-12). This corresponds to the distribution of contaminants in the subsurface. Groundwater gradients in the terrace aquifer, as described in Section 2.5.2, range from about 0.006 ft/ft to about 0.015 ft/ft. Hydraulic conductivity measurements were not collected because the thin nature of the terrace aquifer would not support either a conventional pump test or the use of slug testing methods. Several falling head permeability tests conducted on geotechnical samples yielded several values, one of which is probably most representative of the coarser grained fraction of the terrace alluvium (see Table 2-3, results for Monitoring Well B354-01-26). This sample yielded a hydraulic conductivity of approximately 1,200 ft/day and a porosity of 41 percent. Since 41 percent is an unrealistically high value for porosity, a value of 25 percent (as determined by the USGS for Kansas River alluvial deposits [Myers, 2000]) will be used. The following equation defines the seepage velocity within a granular medium:

$$V = (K \times G) / p$$

V= seepage velocity (Length [L]/Time [T]); K = hydraulic conductivity (L/T); p = effective porosity (unitless); and G = gradient (L/L).

Using the above input parameters yields a seepage velocity ranging from approximately 30 to 70 ft/day for the terrace aquifer.

The groundwater flow regime changes in the Kansas River alluvial aquifer, under the point bar. Here the general direction of groundwater flow is across the point bar, in an easterly direction (see Figures 2-9 through 2-12). This is expected, since this is the direction of flow for the Kansas River. Gradients range from 0.0005 to 0.0008 ft/ft. Hydraulic conductivity, as determined by a variety of aquifer testing methods, generally range from approximately 450 to 1,000 ft/day, with an average of about 700 ft/day. The porosity of the Kansas River alluvial aquifer has been estimated at about 0.25 (Myers, 2000). Substituting these values into the seepage velocity equation yields values ranging from approximately one to three ft/day. Groundwater velocities within the Kansas River alluvial aquifer are only five to ten percent as great as those for the terrace aquifer. These much lower groundwater velocities also allow for more lateral dispersion to occur in the Kansas River alluvial aquifer. This will result in plumes that are wider and less well defined than the plume on the alluvial terrace, which is much narrower. Low areas on the bedrock surface could also be channelizing flow within the terrace aquifer.

Adsorption

Adsorption is the partitioning of organic contaminants from the soluble phase onto the soil matrix. This can result in the retardation of the fronts of contaminant plumes and a loss of mass from the aqueous phase. Adsorption is controlled by characteristics of the contaminant, soil matrix, and the fluid media.

Contaminant characteristics include water solubility, polar-ionic character, and octanol-water partition coefficient. Water solubility is the most important characteristic, with less soluble compounds having a greater tendency to adsorb onto soils. Polar-ionic character affects adsorption by its impact on how contaminate molecules interact, or do not interact, with soil particles. Finally, the octanol-water partition coefficient (K_{OW}) is a measure of how hydrophobic an organic compound is. The more hydrophobic a compound is, the more likely it will be to partition onto soils and have a low solubility in water.

Soil characteristics include texture, permeability/porosity, organic carbon content, and surface area. Organic carbon in a soil is the primary adsorptive surface (Fetter, 1999). Finer grained silts and clays generally have more total surface area than sandy soils, thus providing more total surface area onto which contaminants can adsorb. Fluid media characteristics that influence adsorption include chemical parameters such as pH and salt content.

A simple quantitative mass balance model (presented in Appendix 6A) was used to evaluate the potential for adsorption within the terrace aquifer. The simulation evaluated the redistribution of PCE between soil particles and the aqueous phase along flowpath from Monitoring Well B354-99-08 south to the end of the PCE plume. Assuming no active PCE source in the vicinity of Monitoring Well B354-99-08, the mass balance exhibited a full order of magnitude reduction in total dissolved phase mass along the flowpath (Chen, personal communication, 2003).

Volatilization

Volatilization commonly occurs with organic contaminants within both the saturated and unsaturated zones. This process is controlled by the vapor pressure of the organic solute or solvent, which is the pressure of the gas in equilibrium with respect to the liquid or solid at a given temperature. The vapor pressure represents a compound's tendency to evaporate and is essentially the solubility of the organic solvent in a gas (Domenico & Schwartz, 1990). Volatilization of dissolved organic solutes from water is described by Henry's Law. The Henry's Law constant (K_H) is expressed as atmospheres-m^3/mole. The K_H of PCE and TCE are 0.0083 and 0.01 atmospheres-m^3/mole, respectively. These compounds are fairly volatile, as compared to a compound such as DDT, which is not very volatile and has a K_H of 0.000038 atmospheres-m^3/mole. Volatilization is a mechanism that could possibly contribute to the loss of PCE mass as the groundwater flows to the south from Monitoring Well B354-99-08. The saturated thickness of the terrace aquifer is relatively thin and it is well aerated, based upon DO readings taken during groundwater sampling events.

6.3.2 Destructive Mechanisms

Biodegradation appears to be an active destructive process affecting contaminant fate and transport at the 354 Site. Biodegradation processes result in a reduction of contaminant mass through the transformation of these compounds to other compounds, which in many cases are less toxic. Depending on conditions in the subsurface, biodegradation can be a major part of NA.

It has been demonstrated through both laboratory and field studies that chlorinated solvents are subject to a variety of biodegradation processes (USEPA, 1998). These include both reductive and oxidative degradation pathways, which can ultimately transform these compounds to environmentally benign carbon dioxide (CO_2) and chloride (Cl^-). Abiotic mechanisms, such as hydrolysis, can also degrade some common chlorinated solvents. If geochemical conditions are sufficient in the aquifer to degrade the toxic contaminants of interest, it is possible that NA may be considered as a sole remedial action alternative. On the other hand, if degradation is not sufficiently degrading these compounds, then other engineered remedial alternatives will have to be considered.

6.3.2.1 Biodegradation – Background

Microbial degradation of chlorinated solvents is a complex process. These compounds can be used by microorganisms as either electron donors or electron acceptors, depending upon redox conditions. These compounds can also be degraded by cometabolic processes. The following discussion draws heavily on *Technical Guidelines for Evaluating Monitored Natural Attenuation of Petroleum Hydrocarbons and*

Chlorinated Solvents in Ground Water at Naval and Marine Corps Facilities (Wiedemeier and Chapelle, 1998).

Chlorinated solvents can be reductively dechlorinated under anoxic conditions. For the common chlorinated ethenes (PCE, TCE, DCE, and VC), the process occurs in the following sequence:

$$\text{PCE} > \text{TCE} + \text{Cl}^- > \text{DCE} + \text{Cl}^- > \text{VC} + \text{Cl}^- > \text{ethene} + \text{Cl}^-$$

The efficiency of dechlorination differs for particular compounds and for particular geochemical conditions. The dechlorination of PCE and TCE to DCE occurs under both mild and strongly reducing conditions, while the transformation of DCE to VC, and the transformation of VC to ethene, require the more strongly reducing conditions characteristic of methanogenesis.

Reductive dechlorination is driven by molecular hydrogen (H_2). This shows why the efficiency of reductive dechlorination is sensitive to redox conditions. Hydrogen is continuously produced in anoxic systems by fermentation of organic matter. This is represented by the general relationship:

$$3CH_2O + H_2O > CH_3COOH + CO_2 + 2H_2$$

The hydrogen produced by fermentation is then used by microorganisms such as methanogens:

$$CO_2 + 4H_2 > CH_4 + 2H_2O$$

Hydrogen concentrations are progressively lower under sulfate-reducing, ferric iron [Fe(III)]-reducing, and denitrifying conditions, which support successively more efficient hydrogen users than methanogens. The efficiency of reductive dechlorination is directly linked to the availability of H_2. Under denitrifying conditions, relatively little hydrogen is available, and reductive dechlorination is relatively inefficient. Conversely, significantly more hydrogen is available under methanogenic conditions and reductive dechlorination is more efficient.

PCE and TCE are most commonly degraded by reductive dechlorination. Their daughter products (DCE and VC) can be directly oxidized. For example, under oxic conditions, DCE and VC can be oxidized to CO_2 according to the following equations:

For DCE $$Cl_2C_2H_2 + 2O_2 > 2CO_2 + 2H^+ + 2Cl^-$$

For VC $$ClC_2H_3 + 5/2O_2 > 2CO_2 + H_2O + H^+ + Cl^-$$

The complete degradation of chlorinated solvents is favored by sequential anoxic/oxic conditions:

Anoxic (reductive dechlorination)		Oxic (direct oxidation, cometabolism)
PCE, TCE > DCE and VC	>	DCE, VC > $2CO_2 + Cl^-$

An accurate delineation of redox conditions within the groundwater system is the key to assessing the biodegradation of chlorinated solvents.

Terminal Electron-Accepting Processes in Groundwater Systems

Oxygen, nitrate, Fe(III), sulfate, and CO_2 (methanogenesis) are the most common terminal electron-accepting processes (TEAPs) in groundwater systems. The following five generalized equations describe these processes:

$$O_2 + CH_2O > CO_2 + H_2O$$

$$4NO^-_3 + 4H^+ + 5CH_2O > 2N_2 + 5CO_2 + 7H_2O$$

$$4Fe(OH)_3 + CH_2O + 8H^+ > 4Fe^{2+} + CO_2 + 11H_2O$$

$$2CH_2O + SO_4^{2-} + H^+ > 2CO_2 + HS^- + 2H_2O$$

$$2CH_2O > CH_4 + CO_2$$

The microorganisms that affect these electron-accepting processes compete with each other for available organic carbon sources. Because oxygen is the most efficient electron-accepting process, oxygen-reducing microorganisms outcompete other electron-accepting processes if dissolved oxygen is present in groundwater. Once oxygen is depleted, nitrate-reducing microorganisms will predominate if nitrate is available. Fe(III)-reduction follows nitrate reduction, sulfate reduction follows Fe(III) reduction, and methanogenesis follows sulfate reduction. This process of competitive exclusion leads to the formation of discrete redox zones within the groundwater system. This zonation can be deduced based on the presence/absence of electron acceptors, and the formation of specific end products (see the above five equations).

As an example, if dissolved oxygen is present in groundwater at concentrations greater than 0.5 mg/L, then oxygen reduction will be the predominant microbial process. If dissolved oxygen concentrations are less than 0.5 mg/L, but nitrate is present at concentrations greater than 0.5 mg/L, nitrate reduction will be the predominant microbial process. Because nitrite (NO_2) is an unstable intermediate product of nitrate reduction, the presence of measurable NO_2 concentrations is indicative of nitrate reduction. If groundwater lacks dissolved oxygen or nitrate, and concentrations of ferrous iron (Fe(II)) increase along the flow path, Fe(III) reduction is the most likely predominant process. If groundwater contains concentrations of sulfate greater than 0.5 mg/L and hydrogen sulfide greater than 0.05 mg/L, then sulfate reduction is the most likely predominant process. Finally, if the water lacks dissolved oxygen, nitrate, Fe(II), sulfate, and hydrogen sulfide, but contains concentrations of methane greater than 0.2 mg/L, then methanogenesis is the most likely predominant process. In practice, this method has inherent uncertainties. Many products of microbial metabolism, such as Fe(II), hydrogen sulfide, and methane, can be transported by groundwater flow. In those cases where such transport is significant, it is difficult to determine the exact redox zonation with this water chemistry information (Wiedemeier and Chapelle, 1998).

Organic Carbon Substrates that Support Reductive Dechlorination

Reductive dechlorination requires an organic carbon substrate in order to proceed. These organic carbon substrates initially are degraded by fermentative bacteria that produce H_2 and other organic compounds. Many different kinds of organic carbon can be fermented to H_2 to support reductive dechlorination. However, organic carbon compounds differ substantially in how efficiently they are fermented, and thus in how efficiently they can support reductive dechlorination. While it is difficult to quantify the available mass of fermentable organic carbon supporting reductive dechlorination, it is feasible to assess the geochemical conditions resulting from organic carbon metabolism in an aquifer. For these reasons, it is more appropriate for assessments of biodegradation to focus on ambient geochemical conditions than on measuring available organic carbon.

Concentrations of chlorinated solvents and their degradation products give a direct indication of the presence or absence of microbial degradation (both reductive and oxidative) processes. The production of cis-1,2-DCE, VC, and Cl^- ions along aquifer flowpaths is often direct evidence of biodegradation. Although VC and some DCE isomers can be primary contaminants, VC is not normally present as a primary contaminant in releases associated with military activities. Also, cis-1,2-DCE (rather than trans-1,2-DCE) is usually produced from the reductive dechlorination of TCE. As a general rule, if cis-1,2-DCE comprises more than 80 percent of the total DCE, then the DCE is likely of biogenic origin. Under these conditions cis-1,2-DCE and VC can be reliable indicators of microbial reductive dechlorination.

Geochemical Indicators of Reductive Dechlorination

Biodegradation of organic compounds, whether natural or anthropogenic, creates measurable changes in the groundwater chemistry. By measuring these changes, it is possible to document and qualitatively evaluate the biodegradation occurring at the 354 Site. The following bullets summarize these geochemical indicators (USEPA, 1998).

- ORP: The ORP of groundwater is a measure of electron activity and is an indicator of the relative tendency of a solution to accept or transfer electrons. In the case of chlorinated solvents, each sequential use of electron acceptors drives the ORP into a range within which reductive dechlorination can occur. Because reductive dechlorination is most effective in the sulfate-reduction and methanogenesis ORP range, competitive exclusion between sulfate reducers, methanogens, and reductive dechlorination can occur. An ORP of less than 50 millivolts (mVs) is considered favorable for reductive dechlorination. At ORPs less than –100 mVs, reductive dechlorination is likely to occur.

- DO: DO is the most thermodynamically favored electron acceptor used by microbes for the biodegradation of organic carbon, whether natural or anthropogenic. In the case of chlorinated solvents, anaerobic bacteria optimally function at DO concentrations less than about 0.5 mg/L. Therefore, reductive dechlorination will not occur above this level.

- Nitrate: Nitrate provides a substrate for microbial respiration if oxygen is depleted. For chlorinated solvents, nitrate concentrations in the contaminated portion of the aquifer less than 1.0 mg/L are favorable for reductive dechlorination.

- Iron: Fe(III) is reduced to Fe(II) during biodegradation of organics, thus Fe(II) concentrations can be used as an indicator of anaerobic degradation of chlorinated solvents. Levels of Fe(II) greater than 1.0 mg/L provide evidence that reductive dechlorination is occurring.

- Sulfate: Sulfate may be used as an electron acceptor for anaerobic degradation, resulting in the formation of sulfide. In the case of chlorinated solvents, concentrations of sulfate greater than 20 mg/L may cause competitive exclusion of dechlorination.

- Methane: During methanogenesis, organics are used as electron acceptors and are reduced to methane. For chlorinated solvents, the presence of methane in the groundwater is indicative of strongly reducing conditions. Methane concentrations greater than 0.5 mg/L indicate methanogenic conditions favorable to degradation of chlorinated solvents.

- Chloride: During biodegradation of chlorinated hydrocarbons, chloride is released to the environment, and chloride concentrations in the plume will be elevated compared to background concentrations. Chloride can serve as a conservative tracer for reductive dechlorination.

- Alkalinity: For chlorinated solvents, increases in alkalinity result from interaction of CO_2 with aquifer minerals as a result of degradation. CO_2 forms from the oxidation of VC to CO_2. Therefore, alkalinity potentially increases where aerobic conditions exist (i.e., in the areas of VC degradation).

- TOC: The TOC is a measure of the carbon and energy source in the media. For reductive dechlorination to occur in groundwater at optimal conditions, the TOC values should be greater than 20 mg/L.

The geochemical conditions within any aquifer are complex and there are multiple influences on any geochemical parameter. For example, chloride can be present as a result of free chloride ions being generated during reductive dechlorination. Chloride ions may also be present as a result of the weathering of rocks (for example shale and halite) or from other contaminant sources (landfill leachate or road salt). Alkalinity controls within an aquifer system are also complex, and are dependent on aquifer mineralogy, soil conditions, rainfall pH, and other factors. A detailed analysis of these conditions is outside the scope of this report. However, when evaluated collectively, the geochemical parameters described above can provide a very good indication of whether reductive dechlorination of solvents in taking place within an aquifer.

Cometabolism

When a chlorinated hydrocarbon is biodegraded by cometabolism, the degradation is catalyzed by an enzyme or cofactor that is produced by the organism for other purposes. The organism receives no known benefit from the degradation of the chlorinated hydrocarbon. Cometabolism is best documented in aerobic environments, although it potentially could occur under anaerobic conditions. The rate of cometabolism generally decreases as the degree of dechlorination increases. During cometabolism, the chlorinated hydrocarbon is indirectly transformed by bacteria as they use petroleum hydrocarbons or another substrate to meet their energy requirements. Cometabolism requires the presence of a primary substrate such as toluene or methane at concentrations higher than the chlorinated solvent.

Cometabolism is usually not nearly as important a degradation mechanism as reductive dechlorination for chlorinated solvents. Due to the need for a substrate that may be present in limited concentrations, rates of cometabolism are often slow enough that this process may not be detectable unless the system is stimulated with additional substrate mass (USEPA, 1998 and AFCEE, 1996).

6.3.2.2 Abiotic Mechanisms

Abiotic degradation occurs without microorganisms. Several examples of reactions which may be abiotic include hydrolysis and oxidation-reduction reactions. Hydrolysis is a substitution reaction in which an organic molecule reacts with water or a component ion of water and a halogen is replaced with a hydroxyl group. Oxidation-reduction reactions commonly occur in the presence of electron donors, such as Fe(0) or Fe(II).

6.3.3 Evaluation of Natural Attenuation Parameter Data

NA parameters have been analyzed at the 354 Site since October 2001. Table 6-1 presents the field parameters and NA data collected during the four RI groundwater-sampling events conducted between October 2001 and July 2002. Figures 6-1 through 6-5 present this data for the NA parameters DO, ORP, Fe(II), nitrate, and chloride, respectively. The other major NA parameters (methane, alkalinity, total organic carbon, sulfate, and sulfide) are not depicted on figures because of a lack of variability.

The following discussion presents an evaluation of the data collected for each NA parameter for both the terrace aquifer and the Kansas River alluvial aquifer.

6.3.3.1 Terrace Aquifer

In general, conditions within the terrace aquifer are aerobic and unfavorable for reductive dechlorination. The following is an evaluation of the data collected for each NA parameter, including DO, ORP, Fe(II), nitrate, chloride, methane, sulfate, alkalinity, and TOC. Figures 6-6a through 6-6e depict plots of selected NA parameters (DO, ORP, Fe(II), nitrate, and chloride) along flowpath within the terrace aquifer. This flowpath begins at Monitoring Well B354-01-26 (just southwest of Building 430) and ends at Monitoring Well B354-01-25 (located just north of Building 311).

<u>DO</u>

The DO data collected from terrace aquifer monitoring wells ranged from 0.02 mg/L to 8.73 mg/L (Table 6-1). Only one of fifteen terrace aquifer monitoring wells had DO readings below 0.5 mg/L at least 50 percent of the time (Figure 6-1). Anaerobic bacteria optimally function at DO concentrations less than about 0.5 mg/L. Therefore, reductive dechlorination will not occur above this level. Trend charts along the groundwater flowpath are somewhat ambiguous. Trends indicate a drop in DO along the flowpath in the terrace aquifer (Figure 6-6a); although, these values are virtually all above the threshold level below which reductive dechlorination can occur.

ORP

The ORP data collected from terrace aquifer monitoring wells ranged from 295 mV to a -216 mV (Table 6-1). There were only three terrace aquifer monitoring wells with favorable ORP conditions for reductive dechlorination at least 50 percent of the time (Figure 6-2). Reductive dechlorination is most effective in the sulfate-reduction and methanogenesis ORP range, competitive exclusion between sulfate reducers, methanogens, and reductive dechlorination can occur. ORP measurements along the flowpath show no obvious trends within the terrace aquifer, and virtually all readings are above the 50 mV threshold believed favorable for reductive dechlorination (Figure 6-6b).

Fe(II)

The Fe(II) data collected from terrace aquifer monitoring wells ranged from 8.08 mg/L to 0.0 mg/L (Table 6-1). According to USEPA, Fe(II) levels above 1.0 mg/L indicate reducing conditions, and are favorable for the reductive pathway. Only one of thirteen terrace aquifer monitoring wells had Fe(II) values greater than 1.0 mg/L at least 50 percent of the time (Figure 6-3). There are no significant trends along the flowpath, with the exception of a jump in Fe(II) concentrations, moving down the flowpath into the Kansas River alluvial aquifer (Figure 6-6c).

Nitrate

The nitrate data collected from the terrace aquifer monitoring wells ranged from 34 mg/L to non-detect (Table 6-1). Nitrate provides a substrate for microbial respiration if oxygen is depleted. For chlorinated solvents, nitrate concentrations in the contaminated portion of the aquifer less than 1.0 mg/L are favorable for reductive dechlorination. There was only one terrace aquifer monitoring well (not including bedrock monitoring wells) with favorable conditions for reductive dechlorination based on nitrate groundwater concentrations (Figure 6-4). Nitrate trends observed along flowpath within the terrace aquifer were unfavorable (see Figure 6-6d).

Chloride

Chloride may be found in the groundwater as a result of dechlorination of chlorinated solvents. The use of chloride as an indicator of reductive dechlorination is dependent on background chloride concentrations. USEPA sets this screening level at two times background (USEPA, 1998). For the 354 Site, these values were determined as 56 mg/L for the Kansas River alluvial aquifer and 86 mg/L for the terrace aquifer (see Note 4 on Table 6-1).

Chloride concentrations collected from terrace aquifer monitoring wells ranged from 700 mg/L to six mg/L (Table 6-1). Chloride concentrations at most monitoring wells indicate that reductive dechlorination is occurring at the site (Figure 6-5). Seven of 13 Kansas River alluvial aquifer monitoring wells had chloride readings suggesting favorable conditions for reductive dechlorination at least 50 percent of the time. Chloride trends show a slight increase down the flowpath within the terrace aquifer (ignoring Monitoring Well B354-01-25, a bedrock well which had the highest chloride detections) and a decrease down the flowpath within the Kansas River alluvial aquifer (Figure 6-6e).

Methane

The methane data collected from the terrace aquifer monitoring wells ranged from 387 μg/L to non-detect (Table 6-1). High levels of methane can be indicative of highly reducing conditions and reductive dechlorination can occur when the methane concentration in groundwater is more than 500 μg/L, which indicates methanogenic conditions (USEPA, 1998). There were no terrace aquifer monitoring wells with favorable methane conditions for reductive dechlororination. Most methane detections are below 10 μg/L. Therefore, since methane concentrations are well below 500 μg/L, this suggests that methanogenic conditions do not exist. The only elevated concentration of methane occurred in the groundwater at Monitoring Well TSO292-02 (387 μg/L).

Sulfate

Low sulfate and high sulfide levels may indicate a sulfate-reducing environment. Reductive chlorination can occur when the sulfate concentration in groundwater is less than 20 mg/L (USEPA, 1998). Sulfate concentrations greater than 20 mg/L may cause competition with the reductive dechlorination of chlorinated solvents. This occurs because the sulfate anion is thermodynamically similar to chlorinated solvents as an electron acceptor.

The sulfate data collected from the terrace aquifer monitoring wells ranged from 650 mg/L to non-detect (Table 6-1). Sulfide was not detected in any terrace monitoring well. Only one monitoring well (TS0292-02) had conditions indicating a sulfate-reducing environment. The high sulfate and low sulfide levels detected suggest that sulfate reduction is not occurring within the terrace aquifer.

Alkalinity

Alkalinity levels above the background level may indicate that carbon dioxide liberated during anaerobic degradation of contaminants is reacting with aquifer minerals and raising the alkalinity level. As was the case with chloride, a level two times background is considered indicative of reductive dechlorination. For the 354 Site, these values were determined as 680 mg/L for the Kansas River alluvial aquifer and 816 mg/L for the terrace aquifer (see Note 3 on Table 6-1).

The alkalinity data collected from terrace aquifer monitoring wells ranged from 559 mg/L to 149 mg/L. None of the terrace monitoring wells displayed alkalinity values favorable for reductive dechlorination.

TOC

The TOC data collected from the terrace aquifer monitoring wells ranged from 8.4 mg/L to non-detect (Table 6-1). Generally, a TOC range above 20 mg/L is considered optimal for reductive dechlorination to occur. All values of TOC measured at the 354 Site were below the optimal 20 mg/L.

6.3.3.2 Kansas River Alluvial Aquifer (Point Bar)

In general, geochemical conditions within the Kansas River alluvial aquifer are anaerobic and conducive for reductive dechlorination. The following discussion presents an evaluation of the data collected for each NA parameter. Figures 6-6f through 6-6j depict plots of selected NA parameters along flowpath for the Kansas River alluvial aquifer. The flowpath on the point bar begins at Monitoring Well B354-01-29c and ends at Monitoring Well B354-01-20c (located on the west bank of the Kansas River).

DO

The DO data collected from Kansas River alluvial aquifer monitoring wells ranged from 0.0 mg/L to 7.63 mg/L (Table 6-1). Sixteen of 20 alluvial monitoring wells had DO readings below 0.5 mg/L at least 50 percent of the time (Figure 6-1). Anaerobic bacteria optimally function at DO concentrations less than about 0.5 mg/L. Therefore, reductive dechlorination will not occur above this level. DO readings are lower within the Kansas River alluvial aquifer than the terrace aquifer, but no significant downward trend is noted along the flowpath (Figure 6-6f).

ORP

The ORP data collected from monitoring wells completed in the Kansas River alluvial aquifer ranged from 234 mV to a -217 mV (Table 6-1). Nineteen of 20 alluvial monitoring wells had ORP readings suggesting favorable conditions for reductive dechlorination at least 50 percent of the time; 15 of these had favorable conditions 100 percent of the time. The alluvial monitoring wells with favorable ORP conditions for reductive dechlorination are shown on Figure 6-2. A definite downward trend is noted for the ORP values within the Kansas River alluvial aquifer (Figure 6-6g), where ORP values tend to be below zero mV.

Fe(II)

The Fe(II) data collected from Kansas River alluvial aquifer monitoring wells ranged from 8.04 mg/L to 0.0 mg/L (Table 6-1). Fourteen of 20 monitoring wells had Fe(II) readings suggesting favorable conditions for reductive dechlorination at least 50 percent of the time (Figure 6-3). Fe (II) concentrations increase with distance away from the terrace (Figure 6-6h).

Nitrate

The nitrate data collected from Kansas River alluvial aquifer monitoring wells ranged from 15.3 mg/L to non-detect (Table 6-1). Eighteen of 22 Kansas River alluvial aquifer monitoring wells had nitrate readings suggesting favorable conditions for reductive dechlorination at least 50 percent of the time (Figure 6-4). Nitrate concentrations decrease with distance away from the terrace (Figure 6-6i).

Chloride

Chloride concentrations collected from Kansas River alluvial aquifer monitoring wells ranged from 400 mg/L to 50 mg/L (Table 6-1). All of these monitoring wells had chloride readings suggesting favorable conditions for reductive dechlorination at least 50 percent of the time (Figure 6-5). For the Kansas River alluvial aquifer, this value was determined to be 56 mg/L (twice background). Chloride trends show a slight decrease down the flowpath within the Kansas River alluvial aquifer (Figure 6-6j).

Methane

The methane data collected from the Kansas River alluvial aquifer monitoring wells ranged from 46 μg/L to non-detect (Table 6-1). There were no monitoring wells with favorable methane conditions for reductive dechlororination. Most methane detections were below 10 μg/L.

Sulfide/Sulfate

The sulfate data collected from the Kansas River alluvial aquifer monitoring wells ranged from 420 to 26 mg/L (Table 6-1). Sulfide was detected at two monitoring wells (B354-01-19c and MPL94-02) during the four groundwater monitoring events evaluated. Both of these detections were at the reporting limit of 0.1 mg/L for sulfide. The high sulfate and low sulfide levels detected suggest that sulfate reduction is not occurring within the Kansas River alluvial aquifer.

Alkalinity

The alkalinity data collected from the Kansas River alluvial aquifer monitoring wells ranged from 760 mg/L to 225 mg/L (Table 6-1). Only Monitoring Well MPL94-03 had a single alkalinity value that indicated that reductive dechlorination might be taking place (in excess of 680 mg/L). All other alkalinity values were below this range.

TOC

The TOC data collected from the Kansas River alluvial aquifer monitoring wells ranged from 16.4 to 0.9 mg/L (Table 6-1). All values of TOC measured were below the optimal value of 20 mg/L required to facilitate reductive dechlorination.

The groundwater chemistry parameter data discussed above suggest that conditions present within the Kansas River alluvial aquifer are favorable for reductive dechlorination. The data also indicates that reductive dechlorination is not likely occurring in groundwater within the terrace aquifer. The presence of the PCE daughter products TCE and cis-1,2-DCE, as well as the generally anaerobic conditions, is strong evidence that reductive dechlorination is occurring in the Kansas River alluvial aquifer.

Historical data indicates that the total PCE and TCE concentrations are generally decreasing within the monitoring wells installed in the Kansas River alluvial aquifer. This data also indicates that the current 1,2-DCE plume extends beyond the maximum extent of the PCE and TCE plumes (Figure 5-24). These observations further support the conclusion that reductive dechlorination is occurring within the Kansas River alluvial aquifer.

VC has been detected only at Monitoring Well B354-00-10. This monitoring well is a bedrock well and is located upgradient of the main source of PCE contamination of Building 367. VC was detected at a range of 0.8 μg/L to 2.5 μg/L; however, there is no apparent explanation for its presence in this monitoring well.

There are several possible reasons for the apparent failure of cis-1,2-DCE to reductively dechlorinate to VC:

- Microbial reductive dehalogenation of cis-1,2-DCE to VC occurs at a slower rate than the dehalogenation of TCE to DCE. This commonly results in temporary increases in the cis-1,2-DCE concentrations (Ellis, 1998).

- The higher chlorinated compounds, PCE and TCE, degrade preferentially over the less chlorinated compound, 1,2-DCE, since the amount of energy necessary to remove a chloride increases as the number of chloride on the compound decreases. This potentially results in the situation that low PCE and TCE concentrations are necessary before the bacteria will use the 1,2-DCE.

- According to Semprini, et. al., in the article "*Anaerobic Transformation of Chlorinated Aliphatic Hydrocarbons in a Sand Aquifer Based on Spatial Chemical Distributions*" (Semprini, et. al., 1995), there is evidence that PCE and TCE can degrade under conditions less strongly reducing than methanogenic, but the transformation appears to go only as far as 1,2-DCE.

- This observation was also made in studies of contaminated groundwater in Germany by Kästner (Kästner, 1991). According to these studies, in conditions less than methanogenic, 1,2-DCE accumulated in the environment without subsequent dechlorination to VC.

- Different bacterial populations may be necessary for the degradation of the specific chlorinated compounds. The bacteria necessary to degrade cis-1,2-DCE may not be widely present at the 354 Site.

6.4 CONCEPTUAL SITE MODEL

The primary chlorinated solvent source appears to be located immediately east of Building 367. This source appears to be mostly PCE, based on both soil and groundwater data. TCE and cis-1,2-DCE are present as well, but at significantly lower levels. Secondary chlorinated solvent sources may exist in the vicinity of Building 430, Building 332, and the DPW Compound, but the evidence for this (from soil samples) is not conclusive. There are sources of BTEX contamination in the vicinity of Building 332, the former Building 354, and along the UPRR grade, based on both soil and groundwater evidence.

Chlorinated solvent contamination is transported south of the source area, within the terrace aquifer, to the Kansas River alluvial aquifer. Advection appears to be the dominant transport process, with adsorption playing a major role in reducing the aqueous phase mass of PCE along flowpath. Volatilization might have a minor role in reducing PCE mass within the terrace aquifer. An evaluation of

NA parameters and contaminant chemistry within the terrace aquifer suggests that little or no biotransformation of chlorinated solvents is occurring. DO, ORP, and nitrate levels are high, while Fe(II) levels remain low, all suggesting an environment unsuitable for reductive dechlorination. This is confirmed by high levels of PCE within the groundwater, and modest amounts of the daughter products (TCE and cis-1,2-DCE) present.

Once the contaminant plume intersects the Kansas River alluvial aquifer, the aquifer geochemistry changes and the direction of transport becomes easterly, moving with the general direction of flow of the Kansas River. Dispersion becomes more significant, relative to advection, as groundwater flow velocities tend to be only one-tenth of those within the terrace aquifer. Within the Kansas River alluvial aquifer, geochemical conditions are more conducive for reductive dechlorination. DO, ORP, and nitrate levels drop significantly, and Fe(II) levels increase, thus improving the effectiveness of reductive dechlorination. In addition, PCE disappears shortly after entering the Kansas River alluvial aquifer, to be replaced with TCE, and finally low levels of cis-1,2-DCE.

cis-1,2-DCE is less amenable to dechlorination in an anaerobic reducing environment, compared to PCE and TCE. In this system, it appears that once the degradation pathway reaches cis-1,2-DCE, the dechlorination process slows, leaving cis-1,2-DCE to be further attenuated by nondestructive processes. The absence of VC (except at Monitoring Well B354-00-10) and ethane/ethene throughout the plume also points to stalling of the reductive dechlorination process at cis-1,2-DCE.

Another factor influencing reductive dechlorination is the availability of primary carbon sources to act as electron donors. BTEX is present in groundwater in the area where the plume impacts the Kansas River alluvial aquifer, but is not present downgradient. These organics can serve as a primary substrate for microorganisms facilitating reductive dechlorination. As BTEX is degraded, the reduction of chlorinated substances stalls, leaving cis-1,2-DCE. TOC levels are below the 20 mg/L threshold considered optimal for reductive dechlorination, which may inhibit the continued dechlorination of cis-1,2-DCE.

Sixty-five different chlorinated solvent sites were examined in the Lawrence Livermore National Laboratory Study (LLNL, 1999). The study divided these sites into three groups based upon the presence or absence of 1,2-DCE and VC as follows:

- Type I – No reductive dechlorination – Neither cis-1,2-DCE nor VC present
- Type II – Weak reductive dechlorination – VC not present
- Type III – Strong reductive dechlorination – VC present

The 354 Site is classified as Type II following the LLNL classification. The presence of 1,2-DCE and the general absence of VC in the groundwater at the 354 Site appears to indicate reductive dechlorination rates that are not sufficient to effectively reduce the contaminant plume to the end products of ethene, methane, and ethane in the majority of the plume. One of the most important reasons for this type of plume behavior is that either anthropogenic carbon or native organic carbon is depleted so that the primary substrate for microbes in the reductive dechlorination process is not appropriate to support the reaction. Dilution and dispersion can further reduce the remaining contaminant concentrations in the plume once degradation stalls. It is possible that cis-1,2-DCE may degrade by anaerobic mineralization, but at this time there is insufficient field evidence to confirm whether this process is actually taking place.

Regardless of the actual processes which result in the attenuation and transformation of chlorinated solvents at the 354 Site, the evidence from isoconcentration plots of PCE, TCE, and cis-1,2-DCE indicates that a reduction in both concentration and mass are taking place down flowpath (see Figures 5-19, 5-20, and 5-21). By the time the plume impacts the Kansas River, only cis-1,2-DCE is detected at concentrations one to two orders of magnitude below the MCL of 70 μg/L down to nondetect for that compound.

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7.0 HUMAN HEALTH BASELINE RISK ASSESSMENT

7.1 INTRODUCTION

7.1.1 Purpose

The purpose of this assessment is to evaluate baseline potential risks that might be experienced by human receptors coming into contact with soil and/or groundwater contamination associated with the 354 Site. Given the variation in chemicals associated with each potential source area and differences in land use across the 354 Site, this risk assessment gives separate consideration to each source area. Both current and future potential exposure settings were assessed under the assumption that no further remediation at the 354 Site takes place.

This human health baseline risk assessment (HHBRA) is specific to the 354 Site and will not be applied in whole to any other site. The HHBRA is based on the assumption that the Army will retain operational control of the site and the future land use will be as described in the Real Property Master Plan. In the event the Army were to lose operational control of the property considered in the HHBRA, or the Real Property Master Plan is voided or severely altered in such a way that the reasonably anticipated future land use of the property considered in the HHBRA is altered, this HHBRA will be nullified, and a new HHBRA will be prepared provided contaminant levels warrant re-evaluation.

7.1.2 Methodology

The HHBRA followed procedures outlined in USEPA's *Risk Assessment Guidance for Superfund (RAGS) Volume 1: Human Health Evaluation Manual Part A* (USEPA, 1989), the U.S. Corps of Engineers *Risk Assessment Handbook, Volume 1: Human Health Evaluation* (USACE, 1995a), and other USEPA supplemental guidance documents referenced throughout the text. This subsection briefly summarizes the methodology used in developing the exposure scenarios evaluated in this risk assessment. The information provided in this section is abbreviated from detailed descriptions provided in later sections of the HHBRA. Further discussion of land use and exposure assumptions is provided in Section 7.4, Exposure Assessment.

The 354 Site contains three distinct source areas, all located within the terrace portion of the Site. These three source areas are the Building 367 Area, the Building 354/332/DPW Compound Area, and the Building 430 Area. Each of these areas had measurable levels of potentially site-related constituents in groundwater and soil, or soil-gas in the case of the Building 430 Area. In soil, samples from each of the three areas had similar concentrations of PAHs, although the concentrations in the Building 367 Area were slightly higher than in the other areas, and the concentrations in the Building 430 Area were slightly lower than in the other areas. The VOCs detected in soil or soil-gas varied slightly between the three areas. Chlorinated solvents were the primary volatile constituents in shallow soil in the Building 367 Area, BTEX were the primary constituents in deep soil in the Building 354/332/DPW Compound Area, and CCl_4 and TCE were the constituents detected in shallow soil-gas samples from the Building 430 Area. The groundwater data generally paralleled the soil data, with each source area having similar contaminants in groundwater as were detected in soil, although chlorinated solvents were more widespread in groundwater than in soil. In both soil and groundwater, the highest concentrations of chlorinated compounds were in samples from the Building 367 Area.

The 354 Site is located in an active portion of Main Post. Land use around the Building 367 and Building 354/32/DPW Compound Areas is industrial in nature, while Building 430, a fire station, is adjacent to a residential area. The Building 430 Area is the only area where residents are a potentially exposed population; however, each of the three areas likely has similar worker populations either currently present or reasonably anticipated to be present in the future. Rather than conducting a duplicative evaluation wherein each worker population was evaluated in each source area, the scope of the HHBRA was simplified such that each relevant worker population was evaluated only in the source area with the highest chemical concentrations. The following describes the selection of exposure scenarios for quantitative evaluation:

- Indoor workers represent a potentially exposed population in each source area; however, the levels of chlorinated solvent and PAH contamination were significantly higher in the Building 367 Area than in the Building 430 Area; therefore, a separate indoor worker population was not evaluated in the Building 430 Area. Since the Building 354/332/DPW Compound Area had different contaminants than the Building 367 Area, a separate indoor worker population was evaluated. Thus, two indoor worker populations were evaluated, one each in the Building 367 and Building 354/332/DPW Compound Areas.

- Groundskeepers are likely present in all three areas. The source area near Building 367 is entirely paved, thus limiting the likelihood of direct contact with contaminated soil by a groundskeeper. Therefore, a groundskeeper was not evaluated in the Building 367 Area. Chemical concentrations in soil and groundwater were higher in the Building 354/332/DPW Compound Area than in the Building 430 Area; therefore, groundskeepers were only evaluated in the Building 354/332/DPW Compound Area.

- Utility excavation workers are likely present in all three source areas; however, chemical concentrations were significantly higher in shallow soil samples from the Building 367 Area than in either of the other areas; therefore, utility excavation workers were only evaluated in the Building 367 Area.

- Residents are only expected to be present in the Building 430 Area; therefore, residents were not evaluated in either of the other source areas.

As structured, the HHBRA evaluates the reasonable maximum exposures likely to be experienced by each potentially exposed population. The lesser-exposed scenarios that were not quantitatively evaluated can reasonably be expected to result in lower levels of risk than those scenarios that were evaluated.

7.1.3 HHBRA Organization

The HHBRA is organized into the following sections:

- Introduction (Section 7.1) - The first section states the purpose of the risk assessment, provides a summary of the methodology used in the risk assessment, and explains the report organization.

- Identification of COPCs (Section 7.2) - This section reviews analytical data collected at the 354 Site, evaluates it as to the relevance of its use in the risk assessment, and identifies COPCs.

- Toxicity Assessment (Section 7.3) - General noncarcinogenic and carcinogenic toxicities for COPCs are discussed and toxicity values for quantifying risks are presented in this section. Chemical toxicity summaries are provided in Appendix 7A of this report.

- Exposure Assessment (Section 7.4) - This section considers current and potential future land and water uses to identify possible receptor populations and potentially completed exposure pathways. Exposure point concentrations are estimated from available analytical data and/or the results of contaminant transport modeling. Chemical dose to receptors is then quantified using standard intake calculations.

- Risk Characterization (Section 7.5) - The risk characterization section evaluates the possible nature and magnitude of health risks associated with the 354 Site. Theoretical cancer risks and the likelihood of noncancer adverse health effects are quantified by combining calculated chemical dose with chemical toxicity information. The results are then compared to accepted levels of risk.

- Uncertainties inherent in the process are described in Section 7.6.
- Section 7.7 presents a summary of the HHBRA results.

7.2 IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN

This section presents a brief summary of the historical and RI analytical data with respect to its applicability to the risk assessment. Relevant data are then used to identify media of potential concern and associated data sets. Lastly, the COPCs associated with each medium of concern are identified.

7.2.1 Historical Data Evaluation

Prior to the initiation of the RI fieldwork, several field activities and investigations took place. These include the IWSA, the PSA, the Phase II investigation, various additional site assessment activities, and the IFI. Fort Riley conducted the IWSA in 1992 (LBA, 1992) to identify sites having the potential to release hazardous substances to the environment. The IWSA identified the 354 Site as one of the sites where releases of hazardous substances to the environment either have occurred or were likely to have occurred. Subsequent to the IWSA, site investigations were planned for three groupings of sites, and these site investigations occurred between June 1993 to March 1994.

Dames and Moore conducted the PSA between December 1992 and September 1994 and the Phase II investigation between September 1994 and March 1995. Both the PSA and the Phase II investigation were summarized in the 354 SI (Dames & Moore, 1995). The following activities were conducted during the PSA: soil-gas survey, monitoring well installation, and groundwater sampling. The soil-gas samples were analyzed onsite with a GC. Two monitoring wells (TSO292-01 and TSO292-02) were installed in December 1992 at locations selected based on the soil-gas sampling results. Groundwater sampling was conducted as part of the PSA during both November 1993 and September 1994. Monitoring Wells TSO292-01 and TSO292-02 were sampled for VOCs and lead (see Table A-5 in the RI/FS WP).

The following activities were conducted during the Phase II investigation: soil borings, monitoring well and piezometer installation, in-situ groundwater sampling, and sampling of groundwater from monitoring wells. Between October and December 1994, ten soil borings (354SB-01 through 354SB-10) were advanced and sampled to confirm the findings of the soil-gas survey. Soil samples were tested in the field for TPH by immunoassay. Two duplicate samples were collected and submitted for laboratory analyses for comparison of TPH values. An additional four soil borings (354SB-11 through 354SB-14) were advanced in February 1995 and were submitted for off-site laboratory analyses of VOCs, SVOCs, and TPH to confirm the headspace and immunoassay analyses. Piezometers PZ-A and PZ-B were installed in September 1994 and PZ-A was sampled and analyzed for BTEX on site (PZ-B was dry). Piezometers

PZ-C and PZ-D were installed and sampled in January 1995. All of these samples were analyzed with an on-site GC. In February 1995, three new monitoring wells (MW95-03, MW95-04, and MW95-06) were installed by Dames & Moore and were sampled and analyzed for VOCs, lead, and TPH-DRO in March 1995. Laboratory-analyzed soil data from the Phase II investigation were considered relevant for use in the risk assessment. Since groundwater is a dynamic medium, groundwater data from 1992-1995 are unlikely to represent current site conditions and were excluded from the risk assessment.

LBA conducted additional site assessment activities in December 1995. The additional site assessment activities conducted by LBA consisted of both groundwater sampling and water level measurements. Monitoring wells in the additional site assessment were sampled for VOCs, TPH-GRO, TPH-DRO, metals, and nitrate (see Tables A-5, A-6, and A-7 in the RI/FS WP (BMcD, 1999a)). Since the additional site investigation activities only involved groundwater, these data were not considered to represent current site conditions and were excluded from the risk assessment.

BMcD conducted field activities between August and September 1997 as part of the IFI (BMcD, 1998a). The activities conducted during the IFI include: installation of six temporary piezometers, completion of a soil-gas survey at 71 locations with on-site GC analysis, the collection of 16 subsurface soil samples at 14 locations for on-site GC analysis, installation of 12 direct-push temporary monitoring wells, the collection of groundwater screening samples for on-site GC analysis, and the collection of groundwater samples from 12 existing monitoring wells and piezometers for off-site chemical analysis. The analytical data from the IFI was not used in the risk assessment due to complications within the laboratory that performed the analyses (Intertek Testing Services).

A detailed description of each previously mentioned investigation is located in Section 3.0 of this report. Also a chronology of fieldwork is provided in Table 3-1.

7.2.2 RI Data Evaluation

The RI fieldwork was conducted in two phases. The first phase was completed between July 1999 and August 2000. The resulting data was used to develop the work plan for the second phase of investigation, which was completed between May and November 2001. In the first phase of investigation, groundwater, soil, and soil gas were field screened, with off-site laboratory analysis of selected confirmation samples (soil and groundwater); 11 monitoring wells and 11 piezometers were installed; and surface water from the Kansas River was sampled (BMcD, 2001a). The second phase of investigation consisted of additional field screening of groundwater, soil, and soil gas; off-site laboratory analysis of selected confirmation samples (soil and groundwater); collection and laboratory analysis of 217 soil samples (from 51 locations) for use in the risk assessment; and installation of 11 monitoring wells. Routine groundwater monitoring has been completed throughout the RI. In general, field screening samples were analyzed for selected chlorinated solvents and BTEX. Laboratory confirmation samples were generally analyzed for VOCs. Soil samples for the risk assessment and groundwater samples from routine monitoring events were typically analyzed for VOCs and SVOCs. Since completion of the full monitoring well network in summer of 2001, four rounds of groundwater sampling have been conducted (October 2001, January 2002, April 2002, and July 2002). Groundwater samples from these four sampling events were also analyzed for total RCRA metals. Data collection activities were performed in accordance with the relevant workplans and QA/QC Plans.

The following subsections briefly summarize the results of the RI field activities. Soil analytical data from the 2001 field events are provided on Tables 5-2 through 5-5 and 5-7. Groundwater data collected from monitoring wells since the IFI are provided on Table 5-8.

7.2.2.1 Soil

During the 1999/2000 field activities, most of the soil samples were field screened rather than laboratory analyzed. In the vicinity of Building 367 (see Figure 4-4), two soil samples were sent to an off-site laboratory, B217-SB02 (28- to 30-ft bgs) and B218A-SB01 (15- to 17-ft bgs). Both samples were analyzed for VOCs and RCRA metals. VOCs were not detected in either location, and metals were detected at concentrations below the FFTA-MAAF and/or USGS regional background concentration. In 2001, soil samples were collected from the Building 367 Area specifically for use in the risk assessment. Samples were collected from four intervals: zero- to one-ft bgs, one- to four-ft bgs, four- to seven-ft bgs, and seven- to ten-ft bgs. It should be noted that the entire area around Building 367 is paved; therefore, the zero- to one-ft interval represents the first sampling interval below the pavement. The samples were analyzed for VOCs and PAHs. PCE was detected in samples from all 18 locations at one or more of the sampled depth intervals (see Figures 5-4 through 5-7). TCE was detected in 15 of the 18 locations, in one or more depth intervals (see Figures 5-8 through 5-11). cis- and/or trans-1,2-DCE were detected in 12 of the 18 locations, in one or more depth intervals (see Figures 5-12 through 5-15). Other VOCs detected in soil samples for the Building 367 Area included acetone, carbon disulfide, and m,p-xylene. Low levels of PAHs were detected in samples from 17 of the 18 locations in the zero- to one-ft and/or one- to four-ft depth intervals. Direct-Push Borings B2350 and B2144 also had detections of PAHs in the seven- to ten-ft and four- to seven-ft intervals, respectively. PAHs detected included benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene. With the exception of samples from Direct-Push Boring B2429, which is located farther away from Building 367 and had only low levels of site-related constituents, all of the soil samples collected during 1999 – 2000 from the Building 367 Area were considered relevant to the risk assessment.

Twenty-four direct-push borings were advanced for soil sampling around Building 332 and the former Building 354 in the DPW Compound. During the 2001 phase of investigation, the direct-push borings for this area include: nine direct-push borings (B150 through B158) located just east of Building 332; six borings (B159 through B164) located west of Building 332 in the vicinity of the old wash rack pad; and the nine borings (B165 through B173) located around the former Building 354. Samples were collected from four intervals: zero- to one-ft bgs, one- to four-ft bgs, four- to seven-ft bgs, and seven- to ten-ft bgs. Additionally, samples were also collected from 30-ft bgs at Direct-Push Boring B172 and 24-ft bgs at Direct-Push Boring 173. One sample was collected in 1999/2000 from Direct-Push Boring B119 (three- to four-ft bgs) and no detects of VOCs were identified in off-site lab analyses. Except for Direct-Push Borings B163, B164, B170, and B171 (B171 is covered with gravel, but because gravel can be easily removed, it was considered part of the unpaved area), all 24 direct-push borings are located in paved areas. Only one soil sample from east of Building 332 (B150 through B158) had a VOC detection. This was a detection of PCE at a concentration of 7.5 μg/kg in the zero- to one- ft bgs sample taken at Direct-Push Boring B152 (see Figure 4-6 for locations). The remaining soil samples collected from zero- to ten-ft bgs only had detections of PAHs primarily in the depth intervals of zero- to one- and one- to four-ft bgs. Detected PAHs include benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, anthracene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, ideno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene. BTEX was detected at a depth of 29-ft bgs at Direct-Push Boring B172.

During the 2001 phase of fieldwork, soil samples were collected at Building 430 for off-site analysis of VOCs and PAHs from a total of nine direct-push borings. The Building 430 area was not sampled during the 1999/2001 phase. Except for sample locations B888, B902, B916, and B918, the direct-push boring locations were paved. Samples were collected from four intervals: zero- to one-ft bgs, one- to four-ft bgs, four- to seven-ft bgs, and seven- to ten-ft bgs. PAHs were detected in samples collected from the zero- to one-ft interval at Direct-Push Borings B888, B902, and B916, all located off pavement. PAHs detected included benzo(a)anthracene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. There were no detections of VOCs in the soil samples from the Building 430 Area.

Although no VOCs were detected in soil, a soil-gas survey performed at Building 430 during June and July 2001 yielded detections of CCl_4 and TCE (Figures 5-16, 5-17, and 5-18). Soil-gas sampling was conducted at 180 direct-push borings, with samples taken from depths of both nine- and 15-ft bgs. Detected concentrations were consistently higher in soil-gas samples from the nine-ft interval. The soil-gas samples were analyzed for cis-1,2-DCE, CCl_4, TCE, PCE, and BTEX. Only CCl_4 and TCE were detected and evaluated in this risk assessment.

Soil samples were also collected from various other locations throughout the 354 Site, including the former Service Station and the AGL. Although 354 Site-related constituents were detected in several other locations, the detected concentrations were well below those detected in the three primary source areas. Given the dispersed locations of these samples and the low detected concentrations, locations outside of the Building 367, Building 354/332/DPW Compound, and Building 430 Areas were not included in the risk assessment.

7.2.2.2 Groundwater

Groundwater sampling activities for the RI have included multiple rounds of field screening and periodic sampling of the monitoring wells. Section 5.5 of this Report provides a detailed discussion of groundwater sampling results from the ten groundwater monitoring events that have taken place between September 1997 and July 2002. Because groundwater is a dynamic medium, it is unlikely that older data is representative of current site conditions. Therefore, only groundwater data from the last two years (October 2000, March 2001, October 2001, January 2002, April 2002, and July 2002) were included in the risk assessment.

The primary constituents detected in groundwater are VOCs, mainly chlorinated solvents. In general chemical concentrations are highest in monitoring wells located near the source areas on the terrace and decrease along the path of groundwater flow from the terrace aquifer to the Kansas River alluvial aquifer and toward the Kansas River. The highest concentrations of chlorinated solvents (PCE, TCE, cis- and trans-1,2-DCE) are generally located in Monitoring Well B354-99-08 near Building 367. VC, a degradation product of the chlorinated solvents, has only been detected in Monitoring Well B354-00-10, which is a bedrock well located just north of Building 367 and outside the plume. The PCE plume extends south, with concentrations decreasing towards the south, from Building 367 to just south of the UPRR grade. In the Kansas River alluvial aquifer, the PCE plume remains along the northern margin and does not extend south or east toward the Kansas River. Like PCE, the TCE plume also extends south from the Building 367 Area toward the UPRR grade, although the TCE plume generally appears to end just north of the UPRR grade. TCE concentrations decrease dramatically to the south of Building 367; Monitoring Well B354-99-08 is the only monitoring well with TCE concentrations exceeding the MCL of 5.0 $\mu g/L$. TCE has also been detected at very low concentrations in the Kansas River alluvial aquifer.

The highest concentrations of cis-1,2-DCE have also been in Monitoring Well B354-99-08, but decrease to below 1.0 µg/L at Monitoring Well B354-01-27. A second discontinuous cis-1,2-DCE plume is located south of Building 332, although concentrations in this area have never exceeded the MCL of 70 µg/L. The majority of the cis-1,2-DCE contamination is in the Kansas River alluvial aquifer. Concentrations in the alluvial monitoring wells range from 8.4 µg/L to below 1.0 µg/L, which are well below the MCL of 70 µg/L.

In addition to the PCE and related constituents, separate plumes of CCl_4 and chloroform (a degradation product of CCl_4) and petroleum constituents (BTEX) have been identified at the 354 Site. The highest concentrations of CCl_4 and chloroform detected since October 2000 have been in Monitoring Wells B354-99-08 and B354-01-26. The CCl_4 and chloroform contamination is primarily located in the terrace aquifer, although occasional low level detections (well below the MCL of 5.0 µg/L) have occurred in some of the alluvial wells. Petroleum constituents (BTEX) appear to be located south of Building 332 and the former Building 354. The highest concentrations of BTEX have been detected in Monitoring Well TSO292-02, just north of the UPRR grade. Of the BTEX constituents, only benzene has been detected at concentrations exceeding the MCL of 5.0 µg/L. Since October 2000, other VOCs (1,1,2-trichloroethane, bromodichloromethane, dibromochloromethane, and trans-1,2-DCE) have sporadically been detected at very low concentrations in one or more terrace and/or alluvial monitoring wells.

7.2.2.3 Surface Water

Surface-water samples were collected from the Kansas River by the USGS in March 2000, July 2000, and July 2001. Ten samples were collected on each transect and all samples were analyzed for VOCs. The sample locations and collection methods are presented in the QCSRs/QCTM for the events (see figures in BMcD, 2000d; BMcD, 2000e; and BMcD, 2001e). No contaminants of interest were detected in surface water at the study area, including PCE, TCE, cis-1,2-DCE, or CCl_4.

7.2.3 Media of Potential Concern

In order to determine COPCs, it is first necessary to establish media of potential concern and associated analytical data sets. For this risk assessment, media of potential concern are considered those media known or reasonably expected to be impacted by site-related constituents, and which may be directly or indirectly contacted by humans. This section identifies the media of concern associated with each exposure area. The media of concern and associated data sets for the three source areas under evaluation are summarized on Table 7-1.

Much of the soil sampling data for the 354 Area was obtained through field screening techniques. Field screening data were not used for soil and groundwater since laboratory analyzed data are available and of higher quality. In the Building 430 Area, where soil-gas field screening data identified chemical detections that were not reflected in the soil and/or groundwater data, soil-gas field screening data were included in the risk assessment.

7.2.3.1 Building 367 Area

PAHs and VOCs were detected in soil samples collected from depth intervals ranging from zero- to ten-ft bgs during the 2001 phase of investigation. This area of the 354 Site is entirely paved; exposed surface soil is not present. Thus, exposed surface soil is not considered a medium of potential concern in the Building 367 Area.

Impacted shallow subsurface soil could be contacted; therefore, shallow subsurface soil from zero- to ten-ft bgs is considered a medium of concern. Although numerous confirmation soil samples were laboratory-analyzed during the field screening activities, most of these results were non-detect. A total of 55 confirmation soil samples were analyzed, with 46 of those samples being non-detect for any contaminants. The chemical detected in the remaining 9 confirmation samples included cis-1,2-DCE, PCE, and TCE, with the highest concentrations being 102 µg/kg, 137 µg/kg, and 16.6 µg/kg, respectively. These detected concentrations were significantly lower than the concentrations used in the risk assessment. Therefore, to avoid "diluting" the results of soil samples, confirmation data were not included in the shallow subsurface soil data set. The two samples that were laboratory analyzed during the 1999/2000 fieldwork were non-detect for VOCs, and were collected from depths at which direct contact with soil is unlikely to occur. Therefore, these two data points were not included in the shallow subsurface soil data set. A summary of the analytical data contained in the shallow subsurface soil data set is included on Table 7-2.

VOCs were detected in groundwater samples from monitoring wells located near Building 367; therefore, groundwater is considered a medium of potential concern. The highest concentrations of both PCE (and related constituents) and CCl_4/chloroform have been in Monitoring Well B354-99-08. Although elevated concentrations of several constituents have also been detected in nearby Monitoring Well B354-01-27, the concentrations have consistently been much lower. Therefore, the groundwater data set for the Building 367 Area generally consists of data from Monitoring Well B354-99-08. VC has only been detected in one well at the 354 Site, Monitoring Well B354-00-10, which is a bedrock well located slightly upgradient from Building 367. To allow for evaluation of potential exposure to VC, data from Monitoring Well B354-00-10 were also included in the groundwater data set. Since VC is the only VOC that has been detected in Monitoring Well B354-00-10, only the analytical data for VC were included, non-detect data from other chemicals were not included to avoid "diluting" the data set. Similarly, the non-detect data for VC from Monitoring Well B354-99-08 were also not included. A summary of the analytical data contained in the groundwater data set is included on Table 7-3.

7.2.3.2 Building 354/332/DPW Compound Area

Of the 24 borings advanced in the Building 354/332/DPW Compound Area, only four were placed in unpaved areas. In these four locations, PAHs were detected in the surface interval (zero- to one-ft bgs); therefore, unpaved surface soil is considered a medium of potential concern. A summary of the analytical data contained in the surface soil data set is included on Table 7-4. PAHs were also detected in shallow subsurface soil (one- to ten-ft bgs) in both paved and unpaved locations. However, the concentrations of subsurface PAHs detected in the Building 354/332/DPW Compound Area were below those in the Building 367 Area. Since the exposure scenarios for the two areas would be similar, and to avoid duplicative evaluations, shallow subsurface soil was not evaluated as a medium of potential concern in the Building 354/332/DPW Compound Area.

VOCs in the form of BTEX were detected in deeper subsurface soil samples (11- to 30-ft bgs) near the former Building 354 in the Building 354/332/DPW Compound Area. VOCs can migrate to the surface in the vapor phase; therefore, deep subsurface soil was considered a medium of potential concern in this area. PCE was detected at a very low concentration at sampling location B152 on the northeast corner of Building 332 from the zero- to one-ft bgs interval. Because sampling location B152 is not adjacent to the BTEX-impacted area, including the VOC results from the B152 location would require expanding the VOC data set to include a much larger geographic area and thus a large number of non-detect results. VOCs were not detected in any of the samples collected from locations between the BTEX detections south of the former Building 354 and location B152 near the northeast corner of Building 332. The inclusion of a large number on non-detects would result in significantly "diluting" both the PCE and BTEX exposure concentrations. Since the detected concentration was well below those evaluated in the Building 367 Area, and to avoid "diluting" the BTEX results, the sample with PCE was not included in the VOC-impacted data set. A summary of the analytical data used in the BTEX-impacted deep subsurface soil data set is provided on Table 7-5.

VOCs were detected in groundwater samples from monitoring wells in the Building 354/332/DPW Compound Area; therefore, groundwater was considered a medium of potential concern. Data from the monitoring wells closest to Building 332 and the former Building 354 contained mainly detections of chlorinated solvents. BTEX has been detected primarily in Monitoring Wells TS0292-01 and TS0292-02, which are downgradient of the Building 354/332/DPW Compound Area. To account for both the potential exposures near Building 332 and potential future exposures to area-related BTEX constituents in downgradient groundwater, the exposure area for the Building 354/332/DPW Compound Area was expanded to include Monitoring Wells MW95-06, TS092-01, and TS092-02. A summary of the analytical data used in the groundwater data set is provided on Table 7-6.

7.2.3.3 Building 430 Area

Of the nine locations sampled in the Building 430 Area, only four were in unpaved locations. In three of these four locations PAHs were detected in the surface interval (zero- to one-ft bgs); therefore, unpaved surface soil is considered a medium of potential concern. A summary of the analytical data included in the surface soil data set is provided on Table 7-7. Soil samples collected from one- to ten-ft bgs were all non-detect for both VOCs and PAHs; therefore, subsurface soil was not considered a medium of potential concern.

Although not detected in soil samples, CCl_4, and TCE were both detected in soil gas samples collected from nine- and 15-ft bgs. Soil gas was thus considered a medium of potential concern. CCl_4 and TCE were detected in samples from both nine- and 15-ft bgs; however, the detected concentrations were typically higher in samples from the nine-ft interval. Since the nine-ft interval is also closer to the depths of possible basements in the nearby buildings, only samples from the nine-ft interval were included in the soil-gas data sets. To avoid "diluting" the soil-gas data set with large numbers of extremely low level and/or non-detect concentrations, the data set was restricted to the 80 locations nearest the houses with the highest detected concentrations. Figure 7-1 depicts the exposure area used to establish the data set. A summary of the soil-gas data set is provided on Table 7-8.

VOCs were detected in groundwater samples from the only impacted monitoring well near Building 430 (B354-01-26); therefore, groundwater was considered a medium of potential concern. The only VOCs detected in groundwater samples from Monitoring Well B354-01-26 were CCl_4 and chloroform. CCl_4 was also detected in shallow soil-gas samples, which are more likely to represent vapor concentrations at a building's infiltration point; therefore, CCl_4 in groundwater was not evaluated. However, chloroform was not analyzed in soil gas. Since measured vapor concentrations near buildings are not available, chloroform data in groundwater were included in the risk assessment. A summary of the groundwater data set is provided on Table 7-9.

7.2.3.4 Point Bar

There are no known or suspected sources of contamination in the point bar; groundwater in the Kansas River alluvial aquifer is thought to have become impacted via migration from the source areas on the terrace. Given the lack of source areas that would impact soil, soil was not considered a medium of concern in the point bar.

A summary of analytical data from the 22 monitoring wells in the point bar is provided as Table 7-10. However, groundwater in the point bar alluvial area was not considered a medium of potential concern for the HHBRA. The decision to exclude alluvial groundwater was based on several factors, which are presented in detail in Section 7.4.1, and summarized here. The point bar is part of the 10-year floodplain, and restrictions on floodplain development (Federal Emergency Management Agency [FEMA], 1988) render the area unsuitable for future development. Additionally, Fort Riley has excess drinking water capacity, thus it is unlikely that there will be a need to use groundwater in the point bar as a drinking water source.

Given the restrictions on future development, the only potential exposure point for point bar groundwater is the Kansas River. As described in Section 7.2.2.2, chemical concentrations generally decrease toward the Kansas River. The only constituent that has been detected near the river is cis-1,2-DCE. It has been detected at concentrations well below the MCL of 70 μg/L and is likely a result of biodegradation. Additionally, analyses of samples from the Kansas River have consistently been non-detect for site-related constituents. Given the decreasing chemical concentrations, on-going biodegradation, and absence of detections in the Kansas River, it is unlikely that alluvial groundwater will measurably impact the Kansas River. For the above reasons, groundwater from the point bar was not considered a medium of potential concern.

7.2.4 Identification of COPCs

COPCs include those site-related chemicals detected at the 354 Site that have the potential to impact human health. For this risk assessment, COPCs were generally identified as those organic constituents that were detected in one or more samples from a given data set. As discussed in Section 5.2.1, metals in soil were eliminated from further consideration in the DETMWP and are not considered site-related COPCs in this risk assessment. However, given recent changes in USEPA guidance and USACE policy regarding evaluation of background levels of metals in risk assessments, potential human health risks associated with exposure to background levels of metals in soil are provided in Section 7.6, Uncertainties. Arsenic and lead were detected in groundwater samples from the Kansas River alluvial aquifer at concentrations above both MCLs and FFTA-MAAF background. Although not considered site-related, arsenic and lead would be considered as COPCs in the HHBRA in accordance with recent USEPA and USACE guidance. However, groundwater is not likely to be used as a drinking water source (see Section 7.4.1.2) and is generally too deep to be directly contacted. Given the absence of potentially completed exposure pathways, metals were not included in the quantitative risk assessment. Similarly, non-volatile organics were not retained as COPCs in groundwater due to the lack of completed exposure pathways. It should be noted that the non-volatile organics detected in groundwater are phthalates, which are common laboratory contaminants. Therefore, COPCs consisted of all organic constituents detected in soil and all VOCs detected in groundwater.

The following chemicals were selected as COPCs in shallow subsurface soil in the Building 367 Area:

- PAHs:
  - Acenaphthylene
  - Benzo(a)anthracene
  - Benzo(a)pyrene
  - Benzo(b)fluoranthene
  - Benzo(g,h,i)perylene
  - Benzo(k)fluoranthene
  - Chrysene
  - Dibenz(a,h)anthracene
  - Fluoranthene
  - Indeno(1,2,3-cd)pyrene
  - Naphthalene
  - Phenanthrene
  - Pyrene
- Volatiles:
  - Acetone
  - Carbon disulfide
  - cis-1,2-DCE
  - PCE
  - trans-1,2-DCE
  - TCE
  - m,p-Xylene

The following chemicals were selected as COPCs in groundwater in the Building 367 Area:

- Volatiles:
  - 1,1,2-TCA
  - CCl_4
  - Chloroform
  - cis-1,2-DCE
  - PCE
  - trans-1,2-DCE
  - TCE
  - VC

The following chemicals were selected as COPCs in surface and subsurface soil in the Building 354/332/DPW Compound Area:

- PAHs:

Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
Chrysene
Dibenz(a,h)anthracene
Fluoranthene
Indeno(1,2,3-cd)pyrene
Phenanthrene
Pyrene

The following chemicals were selected as COPCs in deep subsurface soil in the Building 354/332/DPW Compound Area:

- Volatiles:

BTEX

The following chemicals were selected as COPCs in groundwater in the Building 354/332/DPW Compound Area:

- Volatiles:

BTEX
CCl_4
Chloroform
cis-1,2-DCE
PCE
trans-1,2-DCE
TCE

The following chemicals were selected as COPCs in surface soil in the Building 430 Area:

- PAHs:

Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
Chrysene
Dibenz(a,h)anthracene
Fluoranthene
Indeno(1,2,3-cd)pyrene
Phenanthrene
Pyrene

The following chemicals were identified as COPCs in soil gas in the Building 430 Area:

- Volatiles:

CCl_4
TCE

The following chemical was selected as a COPC in groundwater in the Building 430 Area:

- Volatiles:

  Chloroform

7.3 TOXICITY ASSESSMENT

In a risk assessment, toxicity of COPCs is evaluated for both carcinogenic potential and noncarcinogenic adverse health effects. Data regarding health effects are then used to derive numerical toxicity values. The USEPA gathers toxicological information from a variety of sources including experimental animal studies, epidemiological investigations, and clinical human studies. Well-conducted epidemiological studies that show a positive correlation between an agent and a disease represent the most convincing evidence about human risk. At present, human data adequate to serve as the sole basis for the development of toxicity values are available for only a few chemicals. In most cases where there is insufficient direct human data, USEPA uses toxicity information developed from experiments conducted on non-human mammals such as rats, mice, dogs, or rabbits.

The primary source of toxicological information for this report was the USEPA sponsored *Integrated Risk Information System* [IRIS] (USEPA, 2003) or, secondarily, the USEPA's *Health Effects Assessment Summary Tables* [HEAST] (USEPA, 1997a). If toxicity values were not found in IRIS or HEAST, the USEPA National Center for Environmental Assessment's Superfund Technical Support Center (STSC) was consulted for provisional information. Information received from STSC was incorporated into this risk assessment. A summary of toxicity information for the COPCs is presented in Appendix 7A. The Risk Assessment Issue Papers obtained from STSC are presented in Appendix 7B, which also contains the information request table and the transmittal email from USEPA.

The following sections detail information regarding both noncarcinogenic and carcinogenic toxicity values.

7.3.1 Noncarcinogenic Effects

The Reference Dose (RfD) and Reference Concentration (RfC) are the toxicity values used in assessing noncarcinogenic health effects from oral and inhalation exposures, respectively. For noncarcinogenic health effects, the level of exposure below which no adverse health effects develop is termed the threshold level or threshold dose. RfDs and RfCs represent exposure levels that are well below threshold. Each is an estimate of daily exposure to the general human population (including sensitive subpopulations) that is unlikely to pose an appreciable likelihood of adverse effects during a given term of exposure.

RfDs and/or RfCs are derived from experimental no observed adverse effect levels (NOAELs) or lowest observed adverse effect levels (LOAELs) by application of uncertainty factors (UFs) or modifying factors (MFs). UFs of 10 are used to protect sensitive subpopulations, to account for interspecies variability, and to account for data being obtained from subchronic rather than chronic studies. A UF of 10 is also used when the toxicity value is derived from a LOAEL rather than a NOAEL. MFs, usually a value of 10 or less, are applied for uncertainties not addressed by the UFs just listed.

RfD values are expressed as milligrams of chemical per kilogram body weight per day (mg/kg/day), and RfC values are expressed as a chemical concentration in air in milligrams per cubic meter (mg/m^3). For consistency with the inhalation intake dose units, RfC values may be converted to inhalation RfD values, which are then expressed as mg/kg/day (USEPA, 1997a).

There are no dermal toxicity values currently available, necessitating the use of oral toxicity values. However, oral values are typically developed from laboratory animal studies and reflect an administered (in feed or water), rather than an absorbed (through the gastrointestinal tract) dose. The degree of gastrointestinal absorption varies between chemicals with some being readily absorbed and some being poorly absorbed. To reflect this, default gastrointestinal absorption efficiency factors are applied if laboratory studies indicate less than 50 percent gastrointestinal absorption (USEPA, 2001). Available data regarding the COPCs in this evaluation indicate greater than 50 percent gastrointestinal absorption for all of them; therefore, unadjusted oral RfDs were used to evaluate dermal exposure.

Table 7-11 summarizes available RfDs and reference sources. By convention, RfD values, as with all toxicity numbers and risk assessment calculations, are expressed in scientific notation. For example, the oral RfD for benzene, 0.003 mg/kg/day, is expressed as 3×10^{-3} mg/kg/day or 3E-03 mg/kg/day, as shown in the table. It should be noted that STSC only provided a subchronic RfC for CCl_4, which was divided by a factor of 10 to derive a chronic RfD.

7.3.2 Carcinogenic Effects

The toxicity values used in assessing carcinogenic risk are slope factors. A slope factor represents the 95 percent upper confidence limit on the probability that a carcinogen will cause cancer at a dose of one mg/kg/day over a lifetime. Unlike most noncarcinogenic health effects, carcinogenesis is not believed to conform to the concept of a threshold dose. Mechanistic data indicate that even the smallest dose of a carcinogen can lead to a clinical state of disease. For this reason, it is not possible to determine a no-response dose, but rather it is necessary to relate a specific dose to the statistical probability of a carcinogenic response.

For carcinogenic effects, the substance is given a weight-of-evidence classification and a slope factor is calculated. To determine the weight-of-evidence classification, the available evidence is evaluated to determine the likelihood that the agent is a human carcinogen. Table 7-12 shows the USEPA carcinogen weight-of-evidence classification system. In 1996, USEPA proposed revised guidelines for evaluating research evidence for carcinogens, including a more descriptive classification scheme. The IRIS files for benzene and VC are among the few that have been updated to include the revised classification, as well as the traditional scheme that is shown in Table 7-12. The revised classification for benzene and VC is "a known human carcinogen for all routes of exposure based upon convincing human evidence as well as supporting evidence from animal studies."

Based on the potency of the agent as a carcinogen in experimental animals and/or humans, the slope factor is developed. Slope factors are available in IRIS or HEAST for many substances categorized by USEPA as A, B, or C carcinogens. Table 7-13 summarizes the available slope factors, reference sources, and weight-of-evidence classifications for the carcinogenic COPCs.

As with RfDs, slope factors are not available for dermal exposure. For dermal exposure, current guidance recommends that oral slope factors be adjusted to reflect gastrointestinal absorption efficiency only when the absorption efficiency is less than 50 percent (USEPA, 2001). Absorption efficiencies for the COPCs are greater than 50 percent; thus, dermal slope factors represent unadjusted oral slope factors.

7.3.3 Chemicals Without Toxicity Values

Phenanthrene and benzo(g,h,i)perylene are the only COPCs for which no toxicity values were available. The *Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons* (USEPA, 1993) does not identify an appropriate method for quantifying human health risk from exposure to these chemicals. IRIS provides a weight-of-evidence classification for phenanthrene and benzo(g,h,i)perylene of D – not classifiable as to human carcinogenicity. Provisional toxicity values were requested from STSC, but none were provided. Given the lack of available toxicity data, risk from exposure to phenanthrene and benzo(g,h,i)perylene was not calculated.

7.4 EXPOSURE ASSESSMENT

In the exposure assessment, potentially exposed populations and potential pathways of exposure are identified. The assessment considers physical 354 Site features, land use, and zoning in order to identify pathways and populations for exposure. Only completed exposure pathways (i.e., human receptors in contact with contaminated media) may actually pose a human health risk. While planning the RI, a conceptual site model (CSM) showing potentially completed pathways was developed and presented in the DETMWP. This CSM was updated for this risk assessment and is provided as Figure 7-2.

Section 7.4.1 presents a description of the exposure setting and Section 7.4.2 discusses the likelihood for a human population to have direct contact with contaminated media. Section 7.4.3 identifies potentially completed exposure pathways and Section 7.4.4 presents the equations and variables used to quantify chemical intake.

7.4.1 Characterization of the Exposure Setting

The first step in evaluating exposure is to characterize a site with respect to its physical features, current and future land uses, and observed and predicted human activities so that potentially exposed populations at and near the site can be identified.

7.4.1.1 Current and Future Land Use

The 354 Site proper is located within the DPW Compound, which is immediately north of the UPRR right of way. As the RI progressed, the actual area under investigation was expanded significantly to include areas of Main Post to the north and west of the DPW Compound, as well as the point bar of the Kansas River, located to the south. A detailed overview of the 354 Site is shown in Figure 1-2.

The 354 Site is part of the Fort Riley reservation and is not zoned by Geary County. North and west of the UPRR grade is a built-up area (Main Post), with building and road development. Buildings include offices, barracks, family housing units, warehouses, and maintenance facilities. Much of this area is covered with either concrete or asphalt, and has a high density of buried utilities, including water, sewer, electricity, gas, telephone, and fiber-optic cable. South and east of the UPRR grade is the point bar of the Kansas River. Much of the area to the south and east of the UPRR grade, which is located on the Kansas River floodplain, is in a natural or semi-natural state, with large tracts of deciduous forest. The forest area within 100 yards of the Kansas River is conserved as critical habitat for a transient population of bald eagles. It is anticipated that there will be no development within this critical wildlife area. There are some structures in this area, mainly along the UPRR grade and north of Marshall Avenue, which are used for warehouses and as administrative offices. Underground utilities are present, but not as dense as in the Main Post area. There is also a large fenced area to the west of Henry Drive and south of the UPRR grade. Main Post and vicinity are actively used portions of Fort Riley. Current land use, as classified by Fort Riley, is shown on Figure 2-14.

The Fort Riley Master Plan indicates that activity on Main Post is expected to remain at current levels for as long as the Fort continues as an active Army installation. Main Post is listed on the National Register of Historic Places; thus, significant redevelopment or alterations in land use are unlikely to occur. Fort Riley is not presently considered for base closure, and such closure is not reasonably anticipated in the future. Therefore, it can be assumed that future land use will not differ appreciably from historical and present conditions. In the unlikely event that Fort Riley is listed for closure in the future, environmental concerns related to alternative land use will be properly addressed as part of the Base Realignment and Closure (BRAC) process.

Future development south of Marshall Avenue on the point bar is not expected to occur. This portion of the 354 Site is located in the 10-year floodplain of the Kansas River and is designated critical habitat for bald eagles. Restrictions on development in floodplains (FEMA, 1988) limit future use of the point bar area regardless of whether the 354 Site remains under Army control. Similarly, the designation as critical eagle habitat limits the likelihood of future development in this area.

7.4.1.2 Current and Future Water Use

Main Post is presently supplied by the Fort Riley water system. The available yield of water from the Kansas River alluvial aquifer serving Fort Riley is estimated at 50 million gallons per day, which exceeds the requirements of Fort Riley and the surrounding communities (LBA, 1995b). The Fort Riley water supply system is currently served by eight wells with a combined total capacity of 8,400,000 gallons per day (7,900,000 gallons per day after adjusting for fire fighting needs) (LBA, 1995b). Actual water usage represents less than half of the available capacity.

Use of the terrace aquifer as a water supply is not expected given the low transmissivity and poor yield of the terrace aquifer, and the excess capacity available from the current water supply system in the Kansas River alluvial aquifer. Additional supply wells are not anticipated in the Kansas River alluvial aquifer in the vicinity of the point bar due to land development restrictions in the floodplain and the extensive flood control measures required to meet state requirements for public well location, construction, and disinfection (LBA, 1995b). Given the impracticalities of using either the terrace or Kansas River alluvial aquifers for potable water supply, and considering the abundant capacity of Fort Riley's existing water supply system, future use of either terrace or alluvial groundwater at the 354 Site as a potable water source is both unnecessary and highly unlikely.

7.4.2 Potentially Exposed Populations

Potentially exposed populations are those persons whose locations and activities create an opportunity for contact with COPCs. The following sections discuss potentially exposed populations, as they are influenced by the on-post land uses just described. The following subsections discuss the current and future worker and resident populations reasonably expected at the 354 Site.

7.4.2.1 Worker Populations

The 354 Site is located on Main Post, thus there are multiple worker populations expected to be present. In general, these populations include current and future indoor workers in many of the existing buildings, future utility excavation workers, and current and future groundskeepers. Given the many buildings present and variety of uses of these buildings, it can reasonably be expected that full-time indoor workers will be present. None of the activities that take place in this part of Main Post involve routine outdoor workers. The only potential future outdoor workers are security guards that might be added in the Building 367 Area if the nature of the material stored there changes such that additional security is needed. However, Fort Riley regulations limit security guards to maximum shifts of four hours in duration. Thus, even under potential future conditions, full-time outdoor workers are not expected to be present. Therefore, full-time outdoor workers are not considered potentially exposed populations. However, groundskeepers are expected to have occasional presence in the unpaved portions of the 354 Site. Given the widespread presence of underground utilities across the 354 Site, utility excavation workers can reasonably be expected in the area. Although other populations may be present at the 354 Site, such as trespassers and part-time workers, their exposure is likely to be less than that experienced by the above populations; therefore, they were not quantitatively evaluated. To avoid duplicative evaluation, not all populations were assessed in all source areas. The following paragraphs identify which populations were evaluated in each source area.

<u>Building 367 Area</u>

Building 367 and adjacent paved areas are currently used for storage and have historically been used for maintenance of vehicles and other military equipment, including artillery pieces. This area is a possible source area of chlorinated solvents, which may have been used for cleaning and degreasing metal parts. It was assumed that Building 367 could potentially have an indoor worker employed within the building in the future. Since the Building 367 source area is under pavement, groundskeepers in the limited unpaved areas nearby are unlikely to be exposed to contaminants in soil. Various underground utility lines are present within the Building 367 area, including sanitary and storm sewers, as well as water, natural gas, and telecommunications lines. Repair work of utility lines might expose utility excavation workers to elevated contaminant levels in soil. Therefore, potentially exposed populations for the Building 367 Area include a future indoor worker and a future utility excavation worker. Since there are no ongoing sources of contamination, chemical concentrations at the Site have been decreasing and are expected to continue decreasing over time. However, to evaluate worst-case conditions, future indoor workers and future utility excavation workers were evaluated based on current site conditions.

Building 354/332/DPW Compound Area

Current indoor workers and groundskeepers were assumed to be the only potential on-site receptors for the Building 354/332/DPW Compound Area. Building 332 is currently used for vehicle maintenance. The former service station (Building 354) is a source for hydrocarbon and possibly chlorinated solvent contamination. An indoor worker employed in Building 332 was evaluated due to the fact that the facility is currently used for vehicle maintenance. Although an indoor worker was also evaluated in the Building 367 Area, the nature of the subsurface VOC contamination (BTEX) is different than that near Building 367 (chlorinated solvents). Therefore, it was determined that a separate evaluation of indoor workers in the Building 354/332/DPW Compound Area was appropriate. Since the Building 354/332/DPW Compound Area has an unpaved portion, it was assumed that groundskeeping activities would be necessary. Thus, the groundskeeper population was evaluated. Although utilities are present in this area, concentration of contaminants in the shallow subsurface were notably lower than in the Building 367 Area; therefore, a separate utility excavation worker was not evaluated in the Building 354/332/DPW Compound Area. Since there are no ongoing sources of contamination, chemical concentrations are expected to decrease over time. Therefore, separate evaluation of future indoor workers and groundskeepers was not conducted.

Building 430

No worker populations were evaluated in the Building 430 Area. Building 430 is an active fire station; thus, it can reasonably be assumed that indoor workers would be present. However, the COPCs in this area are also present in the Building 367 Area at much higher concentrations. For this reason, separate evaluations of indoor workers in Building 430 was not necessary. Similarly, groundskeepers could also be present around Building 430; however, the COPCs in this area are the same as those present at higher concentrations in the Building 354/332/DPW Compound Area. Therefore, separate evaluation of groundskeepers in the Building 430 Area was not needed.

7.4.2.2 Resident Populations

Building 430, which is an active fire station, is considered a possible source area for CCl_4 as a result of the maintenance and/or training with fire fighting equipment. The area around Building 430 contains duplex houses, personnel barracks, and some single family homes. The fire station is located directly north (up-gradient) of the family housing units. This housing area contains family residences for junior officers. Junior officers can reasonably be expected to have infants and/or young children. It should be noted that this is a military housing unit, and military personnel normally have a two to three year tour of duty. Therefore, the maximum duration any family would be present in the area is three years – the 30-year exposure scenario typically used for residential evaluations is not applicable to the 354 Site.

The potential on-site receptors that were evaluated for the Building 430 area are child residents. Although adult residents are also expected in the Building 430 Area, children represent the more sensitive population. Since the 30-year residential exposure scenario is not applicable, separate evaluation of adult residents or a combined age-adjusted population was not necessary. As with the other two areas being assessed, chemical concentrations are expected to decrease over time. Therefore, separate evaluation of adult residents was not conducted.

7.4.3 Potential Exposure Pathways

Health risks may occur when there is contact with a chemical by a receptor population. Exposed populations must then either ingest, inhale, or dermally absorb COPCs to complete an exposure pathway and possibly experience a health risk. Table 7-14 presents the pathways considered for each of the potentially exposed populations and provides a brief explanation for inclusion in or exclusion from the risk assessment. The following is a discussion of the likelihood of completed pathways.

7.4.3.1 Current and Future Indoor Worker Scenarios

Indoor workers are unlikely to significantly contact contaminated surface or subsurface soil. However, incidental ingestion of impacted surface soil in the form of indoor dust could occur in the Building 354/332/DPW Compound Area. Since the impacted soil around the Building 367 Area is entirely paved, it is unlikely that impacted dust would be present in the building. Therefore, incidental ingestion of impacted soil is not considered a potentially completed exposure pathway for indoor workers in the Building 367 Area. Chemical vapors from VOCs that may be present in subsurface soils beneath and around the building could migrate through the building foundation and into the breathing zone of indoor workers, leading to exposure by inhalation. Terrace groundwater is unlikely to be used as a drinking water source, and there are no direct access points (water wells, etc.) to groundwater at either the Building 367 or Building 354/332/DPW Compound Areas. Therefore, ingestion of and direct contact with groundwater is not expected to occur. It is possible that vapors from impacted groundwater could migrate through soil to the surface.

In summary, the potentially completed exposure pathways for current and future indoor workers are:

- Incidental ingestion of chemicals in surface soil as indoor dust (Building 354/332/DPW Compound Area only)
- Inhalation of vapor phase chemicals from subsurface soil
- Inhalation of vapor phase chemicals from groundwater

7.4.3.2 Future Utility Excavation Worker Scenario

Since utility excavation activities typically involve excavation of soil, utility excavation workers could directly contact contaminated surface and shallow subsurface soils. Direct contact with soil could lead to incidental ingestion of soil and chemical absorption through dermal contact with soil. Excavation activities would disturb soils, thus generating fugitive dusts from contaminated soils that could subsequently be inhaled. Chemical vapors from VOCs detected in surface and subsurface soil are likely to migrate through soils and be present in the breathing zone of a utility excavation worker. Groundwater is unlikely to be used as a drinking water source and depth to groundwater in the Building 367 Area is approximately 52-ft bgs, which was assumed to be too deep for direct contact. Therefore, ingestion of and dermal contact with groundwater are not considered potentially completed pathways. However, since VOCs were detected in the groundwater, inhalation of vapor phase chemicals is considered a potentially completed pathway.

In summary, the potentially completed exposure pathways for future utility excavation workers are:

- Incidental ingestion of chemicals in surface and shallow subsurface soil
- Absorption through dermal contact with chemicals in surface and shallow subsurface soil
- Inhalation of chemicals in fugitive dust
- Inhalation of vapor phase chemicals from surface and shallow subsurface soil
- Inhalation of vapor phase chemicals from groundwater

7.4.3.3 Current Groundskeeper Scenario

Since groundskeeping activities typically involve mowing, direct contact with surface soil was evaluated. Direct contact with surface soil could lead to incidental ingestion of and chemical absorption through dermal contact with surface soil. Mowing activities could generate fugitive dust from contaminated soils that could subsequently be inhaled. VOCs were not detected in surface soil; therefore, inhalation of vapor phase chemicals was not evaluated for surface soil. VOCs were detected in the deep subsurface soil (11- to 30-ft bgs); therefore, inhalation of vapor phase chemicals from deep subsurface soil was evaluated as a potentially complete exposure pathway for the groundskeeper population. Depth to groundwater throughout the exposure area for this population averages approximately 25-ft bgs, which was assumed to be too deep for direct contact, but not too deep for inhalation of vapor phase chemicals from groundwater.

In summary, the exposure pathways considered potentially complete for a current groundskeeper worker are:

- Incidental ingestion of chemicals in surface soil
- Absorption through dermal contact with chemicals in surface soil
- Inhalation of chemicals in fugitive dust
- Inhalation of vapor phase chemicals from deep subsurface soil
- Inhalation of vapor phase chemicals from groundwater

7.4.3.4 Current Child Resident Scenario

Since unpaved areas exist around the family housing units, direct contact with surface soil was evaluated for the current child resident. Direct contact with surface soil could lead to incidental ingestion of and chemical absorption through dermal contact with surface soil. Residential yard activities could disturb soils, thus generating fugitive dusts from contaminated soils that could subsequently be inhaled. VOCs were not detected in soil in the Building 430 Area; therefore, inhalation of vapors from soil is not a potentially completed pathway. Soil-gas measurements were taken at both nine-ft bgs and 15-ft bgs in the Building 430 area, and VOCs were detected at both depths. The detections of both CCl_4 and TCE at the nine-ft bgs interval were higher and more frequent than the measurements at the 15-ft bgs interval. It was assumed that vapors from the nine-ft bgs interval were more likely to impact nearby houses than vapors from the 15-ft bgs interval; therefore, inhalation of vapor phase chemicals in soil gas at the nine-ft depth interval was evaluated for child residents. VOCs were also detected in the groundwater below the Building 430 Area. The soil-gas data and the groundwater data for this area had both similar and different detections. If the same chemical was detected in both soil gas and groundwater, the shallow soil-gas data was used to assess vapor inhalation. Depth to groundwater in this area is about 58-ft, which was assumed to be too deep for direct contact. Since terrace groundwater is unlikely to be used as a potable water source, ingestion of and dermal contact with groundwater were not considered potentially completed pathways.

In summary, the exposure pathways considered potentially complete for current child residents are:

- Incidental ingestion of chemicals in surface soil
- Absorption through dermal contact with chemicals in surface soil
- Inhalation of chemicals in fugitive dust
- Inhalation of vapor phase chemicals from soil gas
- Inhalation of vapor phase chemicals from groundwater

7.4.4 Estimation of Intake

This section of the risk assessment presents the calculation of chemical intake through the exposure pathways identified in Section 7.4.3. Chemical intake is expressed in mg/kg/day. Intakes for all COPCs were quantified using pathway-specific equations taken from USEPA guidance (USEPA, 1989). These equations are presented in Tables 7-15 through 7-18. The exposure and chemical variables used in these equations are discussed in the following sections. The calculated chemical intakes are later used in conjunction with toxicity values to characterize risk, as discussed in Section 7.5, Risk Characterization.

7.4.4.1 Exposure Variables

Recommended exposure variable values from guidance documents were used and referenced, if available. If not, best professional judgment about expected 354 Site conditions was employed to estimate values for the exposure scenarios. The recommended values and estimated values were specifically chosen to result in a reasonable maximum exposure (RME) estimate. An RME represents a high-end exposure situation, but one still within the realm of possible exposures. Values used for each pathway for all receptors characterized are shown on the pathway-specific intake tables (see Tables 7-15 through 7-18) and discussed in the following subsections.

Current and Future Indoor Worker Exposure Variables

The current and future indoor worker was assumed to weigh 70 kilograms (USEPA, 1989), the standard adult weight. For the inhalation intake calculation, for organic vapors, it was assumed that the indoor worker breathes 0.633 cubic meters of air per hour (m^3/hr) (USEPA, 1997). This represents the mean value for an adult based on a long-term average inhalation rate of 15.2 cubic meters of air per day (m^3/day). An incidental soil ingestion rate of 50 milligrams per day (mg/day) (USEPA, 2002a) was used to estimate intake for indoor workers. The fraction of soil ingested from a contaminated source was assumed to be 100 percent.

It was assumed that the indoor worker is a regular full-time worker who is in the area of Building 367 or Building 354/332/DPW Compound for eight hours a day, 250 days per year (USEPA, 1991), for a duration of 25 years (USEPA, 1991). Indoor workers were conservatively assumed to spend 100 percent of their time indoors.

Future Utility Excavation Worker Exposure Variables

A future utility excavation worker was assumed to weigh 70 kilograms (USEPA, 1989). In calculating dermal absorption of chemicals from soil, 3,600 square centimeters (cm^2) was used as the total area of exposed skin based upon the mean value for head, hands, and forearms of adult males (USEPA, 1997). Based on activity-specific data for the "Utility Workers " field study group, a soil to skin adherence factor of 0.20 milligrams per square centimeter (mg/cm^2) was assumed (USEPA, 2001).

For the inhalation intake calculations for dust and vapors it was assumed that the utility excavation worker breathes 2.5 m^3/hr (USEPA, 1997). This is mean value for an outdoor worker based on a short-term heavy activity level. An incidental soil ingestion rate of 330 mg/day (USEPA, 2002a) was used to estimate intake for utility excavation workers. A higher level of soil contact can reasonably be expected to occur during excavation activities; consequently, a higher soil ingestion rate can reasonably be assumed for excavation workers. The fraction of soil ingested from the contaminated source was assumed to be 100 percent for utility excavation workers.

The amount of time estimated for general utility excavation work at Fort Riley was previously identified as six days per year (LBA, 1995b). Based on this estimate, the exposure frequency was assumed to be six days per year. The exposure duration was assumed to equal the standard default of 25 years (USEPA, 1991). The assumed exposure time for a utility excavation worker was eight hours per day.

Current Groundskeeper Exposure Variables

The current groundskeeper was assumed to weigh 70 kilograms (USEPA, 1989). In calculating dermal absorption of chemicals from soil, 3,600 cm^2 was used as the total area of exposed skin based upon the mean value for head, hands, and forearms of adult males (USEPA, 1997). Based on activity-specific data for the "Groundskeeper" field study group, a soil-to-skin adherence factor of 0.02 mg/cm^2 was assumed (USEPA, 2001).

For the inhalation intake calculations for dust and vapors it was assumed that the groundskeeper breathes 1.5 m^3/hr (USEPA, 1997). This represents the mean value for an adult outdoor worker participating in moderate activity (USEPA, 1997). Groundskeepers were evaluated assuming an incidental soil ingestion rate of 100 mg/day (USEPA, 2002a). The fraction of soil ingested from the contaminated source was assumed to be 100 percent for the groundskeeper population.

It was assumed that a groundskeeper would mow a given area once a week during the growing season, which includes May through October. The exposure frequency was, therefore, assumed to be 26 days per year, and the exposure duration was assumed to be 25 years (USEPA, 1991). The assumed exposure time for a groundskeeper was four hours per day. An exposure time of four hours per day was used because the groundskeeper would not likely spend an entire eight-hour shift mowing one area (due to the limited size of the unpaved areas), such as the area around the Building 354/332/DPW Compound.

Current Child Resident Exposure Variables

A current child resident was assumed to weigh 15 kilograms, the recommended default body weight for children from infancy to six years of age (USEPA, 1989). In calculating dermal absorption of chemicals from soil, 2,800 cm^2 was used as the skin surface area based on the mean values for head, hand, forearms, lower legs, and feet (USEPA, 2001). This exposure area was conservatively assumed to represent both winter and summer conditions. The recommended default soil-to-skin adherence factor of 0.2 mg/cm^2 for children 0 to 6 years old was assumed (USEPA, 2001).

For the inhalation intake calculations for dust and vapors it was assumed that the child resident breathes 0.272 m^3/hr (USEPA, 1997) for 24 hours per day, based on the average inhalation rates for children 0 to 6 years old. Since concentrations of chemical vapors tend to be higher indoors than outdoors, child residents were conservatively assumed to spend 100 percent of their time indoors. The recommended conservative default incidental soil ingestion rate of 200 mg/day (USEPA, 1997) was used to estimate intake for child residents. The fraction of soil ingested from the contaminated source was assumed to be 100 percent for the child resident population. It was assumed that children spend 350 days per year at home (USEPA, 1991). Since Fort Riley is a military installation, the exposure duration was set at three years, the higher end of the range of typical tours of duty.

7.4.4.2 Chemical Variables

Data Selection

The soil data sets generated as part of the RI were complex. Matrix interference during the soil analysis caused multiple reanalyses and resampling for some constituents. In particular, matrix interference that was noted during sample analysis indicated that some PAH data may be biased low and VOC data may be biased high.

Correcting for matrix related problems are largely outside of the control of the laboratory. The laboratory typically confirmed the matrix problems with reanalysis or diluted and reanalyzed the samples to lessen the interference. However, dilution resulted in elevated reporting limits for any undetected constituents. In some instances, constituents that were previously detected at low concentrations were diluted-out (i.e., reported as non-detect) in the reanalysis. Since the majority of the QC results were within QC limits for the diluted analysis, the reanalyzed results with the elevated reporting limits were typically higher quality data. However, for the purposes of this evaluation, it was sometimes necessary to use the original results with the lower reporting limit, recognizing that the data may be biased.

Due to the large number of duplicate samples, reanalysis data, and resampled data, there were often multiple results for each sample location and depth (referred to herein as data groups). In general, the most appropriate data point for use in the risk assessment was identified using the following guidelines:

- Data qualified as rejected (R) was not used in the risk assessment.
- For COPCs, if the data group yielded only unqualified non-detect results, then the lowest non-detect result was carried forward in the risk assessment and used at one-half the reporting limit.
- If the data group yielded detections of target constituents and no qualifiers were appended during data validation, then the highest concentration was carried forward in the risk assessment.
- If the data group contained results that were qualified as estimated (J) during data validation, then the data point selection was made based upon recommendations in the QCSR. As a general rule, an unqualified detection of a target constituent was used rather than a qualified detection of the same constituent. It should be noted difference in chemical concentration between the original and reanalyzed result were typically minimal.
- If the data group contained both detections of target constituents and non-detect results, then the detected result was carried forward in the risk assessment. In these instances, the detected value was used even if it was qualified as J during data validation. This situation occurred primarily when sample dilution masked previous low-level detections.

Such matrix inferences were not typically observed in the groundwater data; therefore, data selection for this medium was far simpler. In the case of duplicate analyses, the higher of two detected concentrations was used, and the lower of two non-detect concentrations was used (at one-half the reporting limit). In the case of mixed results, where a sample and its associated duplicate had a non-detect and a detect, the positive detection was carried through the risk calculations.

Exposure Concentrations

Current USEPA risk assessment guidance specifies that the RME for a receptor population be calculated using the 95 percent upper confidence limit (UCL) of the arithmetic mean of chemical concentrations. However, there are instances where the 95 percent UCL can be greater than the maximum detected value, such as when there are elevated detections limit or small sample sizes. In these situations, USEPA allows the maximum observed concentration to be used as the exposure point concentration rather than the calculated UCL (USEPA, 1992).

The 95 percent UCL was calculated assuming a log-normal data distribution using the equation presented in *Supplemental Guidance to RAGS: Calculating the Concentration Term* (USEPA, 1992). The 95 percent UCL value was then compared to the maximum detected concentration for each COPC in each medium of concern, and the lower of the two values was used as the exposure concentration. The maximum detected concentration, the 95 percent UCL, and the value selected as the exposure concentration for each COPC are provided on Tables 7-19 through 7-26. Because different populations are exposed to different media, separate 95 percent UCLs were calculated for each medium and each source area.

Dermal Absorption

Recommended absorption factors for dermal absorption of PAHs and VOCs from soil were obtained from the most recent USEPA guidance (USEPA, 2001) and are presented on Table 7-16. An absorption factor of 0.13 was used for all PAHs, which was based on the absorption factor for benzo(a)pyrene (USEPA, 2001). Current USEPA guidance recommends a dermal absorption value of zero for VOCs based on the assumption that VOCs are likely to volatilize before being absorbed through the skin (USEPA, 2001).

Particulate Emission Factor

Current USEPA guidance states that evaluation of fugitive dust inhalation is not generally necesary for either residential or industrial land use scenarios since risk associated with inhalation of dust is typically several orders of magnitude less than that from soil ingestion (USEPA, 2002a). However, as a conservative measure, inhalation of dust was considered a potentially completed exposure pathway for both residential and industrial scenarios. In this evaluation, dust generation produces a potential chemical exposure situation for a future utility excavation worker, current groundskeeper, and current child resident. The default particle emission factor (PEF) from KDHE RSK Guidance (KDHE, 2001) was used to evaluate the generation of fugitive dust from surface soil for all populations. This PEF value was developed based on procedures and variables identified by USEPA in the *Soil Screening Guidance: Technical Background Document* (USEPA, 1996). For all scenarios, it was assumed that 100 percent of the dust in air was derived from contaminated soil. As a further conservative measure, the chemicals were assumed to be evenly distributed over the entire exposure area generating the dust.

Chemical Vapor Concentrations

This section summarizes the vapor transport calculations, which are detailed in Appendix 7C - Vapor Modeling. Chemical vapor migration from soil to an indoor or outdoor environment consists of three steps: chemical partitioning from soil to soil gas; migration of chemical vapors through the soil column and subsequent emission to ambient air; and mixing of chemical vapors within the ambient environment. Vapor migration from soil to indoor and outdoor air was evaluated in both the Building 367 Area and the Building 354/332/DPW Compound Area. VOCs were not detected in soil samples from the Building 430 Area, and, therefore, vapor migration from soil to indoor and outdoor air was not evaluated. The equation used to calculate the volatilization factors (VFs) from soil to indoor air was obtained from *Standard Guide for Risk-Based Corrective Action at Petroleum Release Sites* (ASTM, 1995) and is based on the indoor vapor model developed by Johnson and Ettinger (1991). The VF equations are simplified versions of the equations used in USEPA's on-line spreadsheets and generally can be expected to yield similar results. The equation used to calculate the VFs from soil to outdoor air was obtained from USEPA's *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA, 2002a). The equations and variables used to calculate the VFs from soil are provided in Appendix 7C on Tables 7C-1 through 7C-11.

Vapor migration from groundwater is similar to vapor migration from soil in that it, too, has three steps; chemical partitioning from groundwater to soil gas; migration of chemical vapors through the soil column and subsequent emission to ambient air; and mixing of chemical vapors within the ambient environment. Vapor migration from groundwater to indoor air was evaluated in all three areas at the 354 Site. Similar to the VF from the soil equation, the equation used to calculate the VF from groundwater to indoor air was obtained from *Standard Guide for Risk-Based Corrective Action at Petroleum Release Sites* (ASTM, 1995) and is based on the indoor vapor model developed by Johnson and Ettinger (1991). The VF equations are simplified versions of the equations used in USEPA's on-line spreadsheets and generally can be expected to yield similar results. The VF from groundwater to outdoor air was also calculated using an equation from *Standard Guide for Risk-Based Corrective Action at Petroleum Release Sites*

(ASTM, 1995). The equations and variables used to calculate the VFs from groundwater are provided in Appendix 7C on Tables 7C-11 through 7C-24.

The soil and groundwater analytical data from the Building 430 Area was either impractical or likely to be unreliable to use in a vapor model for the following reasons: VOCs were not detected in soil samples from this area, groundwater in this portion of the 354 Site is approximately 58-ft bgs, and the detected chemical concentrations in groundwater were very low. Therefore, where data were available it was determined that soil gas was the most appropriate medium for estimating indoor vapor concentrations in the Building 430 Area. The chemical concentrations in soil gas were used in a combined emission rate/indoor air dispersion equation that was obtained from *Risk and Decision Making at Petroleum-Impacted Sites* from the University of California Extension, Programs in Environmental Management (1997). This is a very simple vapor transport model that typically yields more conservative results than those obtained from the Johnson and Ettinger model. The equation and variables used to estimate the vapor concentration from soil gas are provided in Appendix 7C on Table 7C-25.

The VFs from soil and groundwater were combined with the exposure concentrations in soil and groundwater to obtain vapor concentrations in air for soil and groundwater. In the Building 367 and Building 354/332/DPW Compound Areas, vapor concentrations for soil and groundwater were calculated. Since volatilization is a competitive process, it would be duplicative to evaluate inhalation of vapors from both soil and groundwater. Therefore, the higher of the two vapor concentrations was used in the vapor inhalation intake calculations. The calculation and selection of vapor concentrations for use in the risk assessment is provided on Tables 7-27 through 7-31.

7.5 RISK CHARACTERIZATION

To quantify the potential risk posed by exposure to chemicals through identified pathways, the intake of each chemical is combined mathematically with the appropriate toxicity value to estimate the likelihood of health risks. The following two sections define the general risk characterization process for evaluating noncarcinogenic and carcinogenic chemicals. Risk characterization for each potentially exposed population then follows.

7.5.1 General Noncarcinogenic Risk Discussion

To characterize the risk of noncarcinogenic effects, toxicity values for COPCs are used in conjunction with dose estimates from each exposure scenario to quantitatively estimate the potential for adverse health effects. Chemical-specific doses calculated for each exposure pathway are compared with the reference value, RfD, for that chemical. If the estimated dose does not exceed the reference value, then adverse noncarcinogenic health effects are not expected. The comparison of dose to reference value is expressed mathematically as a hazard quotient, which is the dose divided by the reference value:

$$\text{Hazard Quotient} = \text{Dose (mg/kg/day)} / \text{RfD (mg/kg/day)}$$

Hazard quotients for chemicals within a pathway are summed to give the pathway hazard index. Pathway hazard indices are then summed for a total exposure hazard index. This procedure is followed for each exposure scenario. The summation of chemical and pathway hazard indices is conservative and health-protective. If the total hazard index is greater than one, then COPCs are appropriately segregated by target organ to derive a separate hazard index for each chemical group. If the total hazard index for a given target organ is one or less, it is unlikely for even sensitive populations to experience adverse health effects within the described scenario.

7.5.2 General Cancer Risk Discussion

Cancer risk is expressed as a probability of developing a carcinogenic response as a result of exposure to a given chemical. The estimated dose for each cancer-causing substance is multiplied by the corresponding slope factor to calculate risk. The expression is as follows:

$$\text{Risk} = \text{Dose (mg/kg/day)} \times \text{Slope Factor (mg/kg/day)}^{-1}$$

For simultaneous exposure to several carcinogens, the calculated risks are summed within each pathway and then for all pathways to yield total excess cancer risk posed by a site. This procedure is followed for each exposure scenario. This value represents the probability of developing a carcinogenic response that is solely attributable to exposure from the site and is in excess of the general background risk. Based on National Cancer Institute (NCI) statistics (NCI, 1990), background risk may be considered 0.33 (3.3×10^{-1} or 3.3E-01 in scientific notation), since approximately one in three people in the United States will develop some form of cancer during a lifetime.

Given the current assumption that any exposure to a carcinogen poses some risk, zero risk is not achievable in a practical sense. Therefore, ranges of risk have been developed by USEPA for use as remediation goals. To be protective of human health, USEPA believes that exposure to site-related carcinogens should be limited so as to result in an individual upper bound excess lifetime cancer risk level of one in 10,000 or less (Federal Register (FR), 1990). The risk range of one in 10,000 to one in a million is a commonly accepted remediation goal. In other words, an excess lifetime cancer risk greater than one in 10,000 would generally be considered unacceptably high, while risks within the range would be acceptable depending upon site use. Risks of one in a million or less are generally considered insignificant.

7.5.3 Risk Estimates for the Building 367 Area

This section provides the calculated risk estimates for populations evaluated in the Building 367 Area.

7.5.3.1 Future Indoor Worker Scenario

The following paragraphs detail the results of the risk characterization for the Building 367 Area future indoor worker scenario. Although the indoor worker is considered a future population, risk was assessed based on current site conditions.

Noncarcinogenic Risk

Table 7-32 shows intake, reference values, and hazard indices for the indoor worker population in the Building 367 Area. Inhalation of chemical vapors resulted in a pathway and total hazard index of 3E-04. This is below the USEPA level of concern for noncarcinogenic risk, which is a hazard index greater than one.

Cancer Risk

Table 7-33 presents intake, slope factors, and the excess lifetime cancer risk associated with chemical exposure for the indoor worker in the Building 367 Area. The pathway and total excess cancer risk based on inhalation of vapor phase chemicals was 2E-07. This is below the 1E-04 to 1E-06 (one in 10,000 to one in a million) acceptable risk range.

7.5.3.2 Future Utility Excavation Worker Scenario

The following paragraphs detail the results of the risk characterization for the future utility excavation worker scenario in the Building 367 Area. Although the utility excavation worker is considered a future population, risk was assessed based on current 354 Site conditions.

Noncarcinogenic Risk

Table 7-34 shows intake, reference values, and hazard indices for the future utility excavation worker in the Building 367 Area. Incidental ingestion of chemicals in soil resulted in a pathway hazard index of 8E-05. The hazard index for dermal contact with chemicals in soil was 1E-07. The hazard index for inhalation of chemicals in fugitive dust was 5E-10. Inhalation of chemical vapors resulted in a hazard index of 2E-05. The total hazard index was 1E-04. This is below the USEPA level of concern for noncarcinogenic risk, which is a hazard index of greater than one.

Cancer Risk

Table 7-35 presents intake, slope factors, and the excess lifetime cancer risk associated with chemical exposure for the future utility excavation worker in the Building 367 Area. The pathway cancer risk for exposure to chemicals in soil through incidental ingestion was 2E-08. The pathway cancer risk for exposure to chemicals through dermal contact with soil was 2E-09. Inhalation of chemicals in fugitive dust resulted in a pathway cancer risk of 2E-13. The pathway cancer risk for inhalation of vapor phase chemicals was 2E-08. The total excess lifetime cancer risk was 4E-08. This is below the 1E-04 to 1E-06 (one in 10,000 to one in a million) acceptable risk range.

7.5.4 Risk Estimates for the Building 354/332/DPW Compound Area

This section provides the calculated risk estimates for populations evaluated in the Building 367 Area. Future utility excavation workers were not evaluated in this area since the level of exposure is lower than in the Building 367 Area. Similarly, the calculated level of risk for utility excavation workers in the Building 354/332/DPW Compound Area would be lower than in the Building 367 Area.

7.5.4.1 Current Indoor Worker Scenario

The following paragraphs detail the results of the risk characterization for a current indoor worker scenario in the Building 354/332/DPW Compound Area.

Noncarcinogenic Risk

Table 7-36 shows intake, reference values, and hazard indices for a current indoor worker in the Building 354/332/DPW Compound Area. The pathway hazard index for incidental ingestion of chemicals in surface soil was 2E-05. Inhalation of chemical vapors resulted in a pathway hazard index of 3E-03. The total hazard index was 3E-03. This is below the USEPA level of concern for noncarcinogenic risk.

Cancer Risk

Table 7-37 presents intake, slope factors, and the excess lifetime cancer risk associated with chemical exposure for the current indoor worker in the Building 354/332/DPW Compound Area. Incidental ingestion of soil resulted in a pathway cancer risk of 5E-07. The pathway cancer risk based on inhalation of vapor phase chemicals was 2E-08 The total excess cancer risk was 5E-07. This is below the 1E-04 to 1E-06 (one in 10,000 to one in a million) acceptable risk range.

7.5.4.2 Current Groundskeeper Scenario

The following paragraphs detail the results of risk characterizations for the current groundskeeper scenario in the Building 354/332/DPW Compound Area under current exposure conditions.

Noncarcinogenic Risk

Table 7-38 shows intake, reference values, and hazard indices for the current groundskeeper scenario. Incidental ingestion of chemicals in soil resulted in a pathway hazard index of 5E-06. The hazard index for dermal contact with chemicals in soil was 5E-07. The hazard index for inhalation of chemicals in fugitive dust was not calculated due to the lack of inhalation toxicity values for chemicals detected in surface soil. Inhalation of chemical vapors resulted in a hazard index of 8E-04. The total hazard index for all pathways combined was 9E-04. This is below one, the USEPA level of concern for noncarcinogenic risk.

Cancer Risk

Table 7-39 presents intake, slope factors, and the excess lifetime cancer risk associated with chemical exposure for the current groundskeeper scenario in the Building 354/332/DPW Compound Area. The pathway cancer risk for exposure to chemicals in soil through incidental ingestion was 1E-07. The pathway cancer risk for exposure to chemicals through dermal contact with soil was 9E-09. Inhalation of chemicals in fugitive dust resulted in pathway cancer risk of 1E-12. The pathway cancer risk for inhalation of vapor phase chemicals was 1E-09. The total excess lifetime cancer risk for all pathways combined was 1E-07. This is below the 1E-04 to 1E-06 (one in 10,000 to one in a million) acceptable risk range.

7.5.5 Risk Estimates for the Building 430 Area Child Resident Scenario

The following paragraphs detail the results of the risk characterizations for the child resident scenario under current exposure conditions in the Building 430 Area. Indoor workers, groundskeepers, and utility excavation workers were not evaluated in this area since the expected levels of exposure are less than in other areas. Similarly, the calculated risk would be lower in the Building 430 Area than in the other source areas.

Noncarcinogenic Risk

Table 7-40 shows intake, reference values, and hazard indices for the current child resident in the Building 430 Area. Incidental ingestion of chemicals in soil resulted in a pathway hazard index of 2E-04.

The hazard index for dermal contact with chemicals in soil was 7E-05. The hazard index for inhalation of contaminated fugitive dust was not calculated due to the lack of toxicity values for chemicals detected in surface soil. Inhalation of chemicals in vapors resulted in a hazard index of 4E-05. The total hazard index was 3E-04. This is below the USEPA level of concern for noncarcinogenic risk, which is a hazard index greater than one.

Cancer Risk

Table 7-41 presents intake, slope factors, and the excess lifetime cancer risk associated with chemical exposure for the current child resident in the Building 430 Area. The pathway cancer risk for exposure to chemicals in soil through incidental ingestion was 6E-07. The pathway cancer risk for exposure to chemicals through dermal contact with soil was 2E-07. Inhalation of contaminated fugitive dust resulted in a pathway cancer risk of 5E-12. The pathway cancer risk for inhalation of vapor phase chemicals was 1E-10. The total excess lifetime cancer risk was 8E-07. This is below the 1E-04 to 1E-06 (one in 10,000 to one in a million) acceptable risk range.

7.6 UNCERTAINTIES

Conducting a risk assessment requires making a number of assumptions, which serve to introduce degrees of uncertainty in the final result. The following sections discuss the uncertainties resulting from chemical identification (Section 7.2), toxicity assessment (Section 7.3), and exposure assessment (Section 7.4).

7.6.1 Uncertainty Associated with Chemical Identification

Sampling and Analysis

At any site, it is possible that there are more individual chemical substances present than identified in the sampling and analysis effort. The selection of media to be sampled, number of samples, and analyses requested are determined by a review of the history of the site, information on current conditions, and an evaluation as to which chemicals could potentially be present. Extensive historical information was available regarding the work performed, chemicals used, and waste management practices employed at the 354 Site.

Given the nature of the 354 Site and the level and identity of the chemicals analyzed in the sampling efforts, it is unlikely that significant chemical contamination went undetected. Further, the application of quality control throughout the sampling, analysis, and data validation phases reduced uncertainty in the results. Therefore, the chemical identification phase of the risk assessment does not appear to have introduced significant uncertainty.

Evaluation of Metals in Soil

As discussed in Section 5.2.1, metals in soil were eliminated from further consideration in the DETMWP and were not considered site-related COPCs in this risk assessment. However, recent changes in USEPA guidance and USACE policy now require evaluation of background levels of metals in risk assessments. Metals were detected in soil samples from various locations and depths around the 354 Site. Since the metals results were not located within specific areas, but rather were spread throughout multiple sections of the 354 Site, no attempt was made to develop area-specific data sets. Rather, risk calculations were completed on maximum detected concentrations of metals in soil. All of the metals results were from subsurface soil samples, with the maximum detected concentrations for all metals being in samples collected from 3 –4 feet bgs. Given that shallow subsurface data is the medium under evaluation, the only potentially exposed population consists of utility excavation workers. Risk from exposure to background levels of metals in soil through incidental ingestion, dermal contact, and inhalation of dust was calculated based on the exposure variables previously identified (Section 7.4.4) for utility excavation workers. The total hazard index for utility excavation worker exposure to background levels of metals in soil was 2E-03, and the total excess lifetime cancer risk was 3E-07. Both the total hazard index and total excess lifetime cancer risk were below acceptable levels.

7.6.2 Uncertainty from Toxicity Assessment

Available Toxicity Values

For some chemical substances, such as chrysene, there is little or no toxicity information available and for many chemicals, what is available is typically from animal studies. The relative strength of the available toxicological information generates some uncertainty in the evaluation of possible adverse health effects and the exposure level at which they may occur. To provide for a margin of error, USEPA applies conservative adjustments to the toxicity values.

For noncarcinogenic substances, RfD and RfC values are typically established only after uncertainty and/or modifying factors are applied. These factors may result in an RfD/RfC that is as little as a thousandth or less of the "safe" dose level determined through animal studies.

For carcinogens, the slope factor represents the 95 percent upper confidence limit of an extrapolated low dose response curve. The actual carcinogenic potency of a substance at low doses is almost certainly less. Additionally, many substances identified as carcinogens in high-dose laboratory testing may not be carcinogenic at low doses and/or may not be carcinogenic to humans.

Extrapolated and Provisional Values

To quantify risk from chemicals that do not have toxicity numbers posted in IRIS or HEAST, provisional numbers generated by STSC are used when available. These provisional numbers typically have not been subjected to the rigorous review process undergone by values in IRIS or HEAST. Uncertainty is generated by the use of provisional numbers. However, this uncertainty is less than that generated by ignoring or qualitatively assessing risks.

Numerical toxicity values for dermal exposures have not been developed by USEPA. To quantitatively assess risk from dermal exposure, USEPA guidance recommends adjusting oral RfDs and slope factors, usually presented as administered instead of absorbed doses, by chemical-specific gastrointestinal absorption factors to account for the differing dose calculation. Because of potential differences in patterns of distribution, metabolism, and excretion between oral and dermal routes of exposure, use of adjusted oral toxicity values may over- or under-estimate risk, depending on the chemical. Because the COPCs in this evaluation had greater than 50 percent gastrointestinal absorption, no absorption adjustment was performed.

Evaluation of TCE

Currently, USEPA recommends that cancer risk be calculated for human populations potentially exposed to TCE. However, conflicting evaluations of the potential carcinogenicity of TCE have been presented, resulting from varying interpretations of the toxicological data. The International Agency for Research on Cancer (IARC) classified TCE as a probable human carcinogen in 1995, based primarily on studies showing carcinogenicity in rodents. Conversely, in 1994 the American Conference of Governmental Industrial Hygienists (ACGIH) classified TCE as "not suspected to be a human carcinogen" at accepted occupational levels.

Chronic, high-dose exposure to TCE has been shown to induce pulmonary tumors and hepatocarcinomas in mice and renal tumors in rats. However, epidemiological studies have not demonstrated a causal association between occupational TCE exposure and lung, liver, or kidney cancers in humans. Evaluation of the toxicological data indicates that the disparity in effects is likely due to species-specific differences in TCE metabolism, as it is the metabolites that appear to be responsible for the carcinogenic action in rodents. Although humans and rodents metabolize TCE in similar manners, producing the same general metabolites, different species form these metabolites at different rates and ratios. As a result of these species-specific differences, higher concentrations of the active metabolites are produced in rodents than in humans. Although the mechanisms of action by which TCE causes kidney and liver cancer are not yet fully understood, the available epidemiological evidence suggests that humans who are exposed at environmentally relevant concentrations are not at increased risk of developing cancer.

When taken together, the mechanistic and epidemiological data fail to support the supposition that TCE is a human carcinogen. Based on current USEPA guidance, TCE was evaluated in this risk assessment as a carcinogen. Based on recent evaluations of TCE data, it is likely that inclusion of TCE in the theoretical excess cancer risk estimates likely overestimates the level of risk posed by exposure to site-related constituents in soil and groundwater.

7.6.3 Uncertainty from Exposure Assessment

When evaluating exposure, probable scenarios are developed to estimate conditions and duration of human contact with COPCs. Scenarios are based on observations or assumptions about the current or potential activities of human populations that could result in direct exposure. To prevent underestimation of any risk, scenarios incorporate exposure levels, frequencies, and durations at or near the top end of the range of probable values. This is sometimes termed a reasonable maximum exposure, one that may be unlikely or at the high end of a range of exposures, but still possible.

Exposure Variables

Default values, such as respiration rates, are used in the exposure calculations to quantify intakes. Although they are based on USEPA-validated data, there is uncertainty in the applicability of such values to any particular exposed population or individual. To compensate for this uncertainty, the default values are typically set to the upper end (usually the 90th or 95th percentile) of the normal range.

The default adult soil ingestion rate is 100 mg/day (USEPA, 1997 and 2002a). The basis for the value is a study by Calabrese, et al. (1990) and a paper by Hawley (1985). These differing approaches produced estimated daily adult soil ingestion rates ranging from 0.5 mg/day to 480 mg/day depending on the activity. The intake rate "measured" by Calabrese was used, with the Hawley paper providing support, to establish the default adult soil ingestion rate of 100 mg/day.

The Calabrese study had significant limitations (USEPA, 1997) as well as serious methodological problems related to tracer detection limits (Calabrese and Stanek, 1991; Stanek and Calabrese, 1991). Stanek, et al. (1997) later published the results of a second pilot study that overcame some of the problems with the first study and produced a very different result. The average adult soil ingestion rate was estimated at 6 mg/kg. Based on the second pilot study, the default adult soil ingestion rate of 100 mg/day appears to be grossly overestimated.

The current default soil ingestion rate of 330 mg/day for excavation scenarios was obtained from the aforementioned second pilot study by Stanek, et al. (1997) and represents the 95th percentile value identified in the study. However, the authors of the study specifically state that the 331 mg/day value identified in the study is "substantially uncertain" based on the presented data. Use of this value results in a high degree of uncertainty in the final results.

Exposure Concentrations

Exposure concentrations of COPCs are developed from analytical results then calculated or modeled for each applicable exposure route. For the current scenarios, it was assumed the contaminant levels used in the exposure calculations remained constant throughout the exposure period with no reduction due to chemical depletion or degradation. This is conservative and most likely results in overestimation of exposure. The associated uncertainty is that actual risk is much less than estimated.

Due to the limited number of deep subsurface soil samples in the Building 354/332/DPW Compound Area, maximum detected concentrations were used in the risk calculations. The average chemical concentrations in soil across the associated exposure area are almost certainly lower than the maximum values used in this assessment. Therefore, risk to populations in the Building 354/332/DPW Compound Area has likely been overestimated.

The chemical concentrations employed in the exposure assessment were the maximum value or the 95 percent UCL of the values for validated data. The use of maximum concentrations or UCLs is a conservative approach that tends to overestimate the "real" exposure point concentrations. Additionally, the 95 percent UCL was calculated assuming a lognormal data distribution instead of testing the distribution first. USEPA has stated that this is a reasonable assumption for most soil sample data sets (USEPA, 1992). However, this assumption may affect the resulting 95 percent UCL and possibly the exposure point concentration, resulting in an over- or underestimation of risk.

The uncertainty associated with the exposure assessment is appreciable. However, the uncertainty is from conservative overestimation of exposure variables. This is protective of potentially exposed populations.

All of these factors contribute to significant uncertainty in the estimates of risk. However, the uncertainty is generally that risk has been overestimated, not underestimated.

7.7 HHBRA SUMMARY

The potential for human health risk from exposure to chemicals at the 354 Site was considered for the soil, groundwater, and air media. COPCs at the 354 Site include the following: PCE and related compounds (TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE and vinyl chloride), 1,1,2-trichloroethane, CCl_4 and related compound chloroform, BTEX petroleum constituents, acetone, and carbon disulfide. Because there are three distinct source areas at the Site, risk was evaluated separately for the Building 367 Area, the Building 354/332/DPW Compound Area, and the Building 430 Area. Based on observed 354 Site conditions, it was concluded that current and potential future populations could be exposed to site-related constituents through direct contact with soil and/or inhalation of chemical vapors from soil, soil gas, and groundwater. Potential intakes of the COPCs were calculated using standard USEPA equations for intake from ingestion, dermal contact, and inhalation of contaminants. Cancer and noncancer risks were calculated for the following scenarios: current indoor worker exposure to vapors from soil or groundwater (Building 367 and Building 354/332/DPW Compound Areas); future utility excavation worker exposure to impacted soil and vapors from soil or groundwater while excavating (Building 367 Area); current groundskeeper exposure to impacted soil and vapors from soil or groundwater while mowing (Building 354/332/DPW Compound Area); and current child resident exposure to impacted soil and vapors (Building 430 Area) from soil gas or groundwater.

For exposure concentrations, 95 percent UCLs of the mean were calculated assuming lognormally distributed soil and groundwater data. Exposure concentrations represented the lower of either the 95 percent UCL or maximum detected concentration. In the Building 367 and Building 430 Areas, the exposure concentrations were predominantly represented by 95 percent UCLs, whereas maximum detected concentrations were primarily used in the Building 354/332/DPW Compound Area. For exposure concentrations that might be experienced in the future by a utility excavation worker, soil chemical concentrations under current conditions were assumed. Vapor concentrations used in the exposure calculations were determined by modeling contaminant partitioning from soil and/or groundwater to soil gas, migration of soil gas to the surface, and dilution in the breathing zone at the receptor point. Since vapor migration is a competitive process, it would be duplicative to evaluate inhalation of vapors from both media. Therefore, the higher of the two vapor concentrations was used in the vapor inhalation intake calculations.

The results of the risk characterization indicate that the excess cancer risks for all populations evaluated were below the USEPA's allowable levels. The hazard indices for the populations assessed were also below the USEPA's level of concern. A summary of the calculated hazard indices and cancer risks for each exposure scenario is provided on Table 7-44.

Uncertainties in the risk assessment process were evaluated. It was concluded that, when combined, the uncertainty associated with each step most likely resulted in a conservative overestimate of risk, particularly in the Building 354/332/DPW Compound Area where risk calculations were based primarily on maximum chemical concentrations.

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8.0 ECOLOGICAL EVALUATION

8.1 INTRODUCTION

This component of the risk assessment is designed to be a semi-quantitative evaluation of whether ecological receptors could experience potential adverse effects from exposure to site-related chemicals. An ecological risk does not exist unless (1) the chemical, or stressor, has the inherent ability to cause one or more adverse effects, and (2) it co-occurs with or contacts an ecological receptor for a sufficient time and intensity to elicit the identified adverse effect (USEPA, 1992a). In order to assess the potential risk to ecological receptors the following steps are necessary:

- Identify the stressors,
- Determine the potential of the stressor to cause adverse effects,
- Determine the level at which the stressor is present in the environment, and
- Determine the availability of the stressor to ecological receptors.

This ecological evaluation was conducted following the procedures outlined in *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessment* (USEPA, 1997b), and *USACE Risk Assessment Handbook Volume II: Environmental Evaluation* (USACE, 1996a). The ecological evaluation is organized into the following sections:

- Ecological Site Characterization – This section provides a description of the ecology at the 354 Site. Threatened, endangered, and rare species in the area are identified, and ecological conditions that influence the presence or absence of ecological receptors are detailed.
- Ecological Evaluation Process – This section describes the methodology for this semi-quantitative screening and the process of refining the list of chemicals of potential ecological concern (COPECs). Probable ecological receptors are described in general for Fort Riley and appropriate species for the screening evaluation are selected. The primary exposure pathways are identified.
- Risk Characterization – This section evaluates the likelihood of potential risk to ecological receptors from the area.
- Predicted Future Conditions and Potential Risk – This section discusses the likelihood of future potential risk.

- Uncertainties – This section of the evaluation explains the uncertainties inherent in the process.

- Summary – This section provides a summary of the ecological evaluation.

8.2 ECOLOGICAL SITE CHARACTERIZATION

The ecological site characterization is a description of the local ecology of the potentially impacted areas and ecological receptors. Ecological clues, such as absence of typically present species, dead or dying vegetation, or unusually high numbers of a less dominant species, are important to data interpretation and risk analysis and were investigated within the 354 Site. The potential presence of sensitive receptors in the area, including threatened or endangered species, wetlands, streams, lakes, etc., were identified by reconnaissance conducted by BMcD biologists familiar with regional flora and fauna. Additionally, the Kansas Department of Wildlife and Parks' (KDWP) Riley County list of threatened and endangered species was also reviewed.

While planning the RI, a CSM showing potentially completed pathways was developed (Figure 8-1). The following sections give a description of the 354 Site including a description of the ecological setting, potential ecological receptors, and exposure pathways. Information detailing historic uses, potential sources, and associated contaminants at the 354 Area were included in section 1.0 (Introduction), 3.0 (Previous Investigations), and 5.0 (Nature and Extent of Contamination). The fate and transport mechanisms are discussed in Section 6.0 (Fate and Transport Evaluation).

8.2.1 Ecosystems and Species of Potential Concern

Ecological surveys were conducted on September 10, 2002 within the approximately 400-acre 354 Site. The ecological surveys included a threatened and endangered species habitat assessment; however, no trapping surveys of wildlife or threatened or endangered species occurred. The 354 Site consists of terrace and point bar areas separated by a UPRR corridor (See Section 2.0). The terrace area lies to the north of the UPRR corridor and is the developed portion of the 354 Site. The point bar area lies south of the UPRR corridor and is mostly undeveloped. Wildlife and potential habitat in the terrace and point bar areas of the 354 Site were identified during the September 2002 site visit.

The terrace contains many base buildings, roads, and equipment storage areas covered with concrete, asphalt, or gravel. Maintained lawns, consisting mainly of fescue, are the dominant plant community within this area. Concrete-lined drainage ditches are present in the terrace area to accommodate stormwater runoff. The main areas of concern in the terrace area of the 354 Site include spills and underground storage tanks associated with Buildings 430, 367, 332, and 354 (see Figure 5-1). Parking lots and mowed and maintained grassy lots with ornamental shrubs and trees are present in the vicinity of

Building 430. Paved and graveled parking lots and equipment storage areas surround Buildings 367 and 354. Minimal habitat for wildlife species is present in the vicinity of Building 430 and no vegetation or habitat for wildlife is present in the vicinity of Buildings 367 and 354. Base buildings, parking lots, and maintained lawns surround all three buildings. Near-site areas consist of urbanized areas with minimal habitat for wildlife species. Only common species that are tolerant of human disturbances (e.g., mice, mourning doves, squirrels, and eastern cottontails) are likely to occur in the terrace area. Given the lack of suitable habitats, no threatened or endangered species are likely to occur in the terrace area or in the vicinity of Buildings 430, 367, 332, and 354.

The majority of the point bar area of the 354 Site is relatively undeveloped and consists of upland forest habitat (see Figure 2-15). Roads and trails exist in the southwestern half of the upland forest. A narrow riparian forest habitat exists along the edge of the Kansas River. Two small, limestone and concrete-lined, drainage ditches carry rainwater runoff through the upland forest. Both ditches receive stormwater runoff from concrete-lined ditches on the Main Post in the terrace area. These two ditches meet, form a channel approximately ten feet deep and twenty-five feet wide, and empty into the Kansas River. The Henry Drive viaduct is the western edge of the point bar area of the 354 Site and the Kansas River forms the southern and eastern border of the point bar area. A transmission line corridor, cleared lots, and base buildings are northeast of the point bar area. The horse corral, which consists of upland woods and grassy meadows, is present west of the Henry Drive viaduct. A variety of common plant and wildlife species inhabit the upland forest and riparian forest habitats of the point bar. Threatened or endangered species could occur in the point bar; however, they are likely to be transient inhabitants. Bald eagles, which are known to occur along the Kansas River adjacent to the 354 Site, could potentially occur in undeveloped areas of the point bar along the Kansas River.

The Kansas River flows from west to east and defines the southern border of the 354 Site. The Kansas River is a protected aquatic habitat by both state and federal law, and is part of the designated critical habitats for the bald eagle, piping plover, and interior least tern. Critical habitats include areas documented as currently supporting self-sustaining populations of any threatened or endangered species of wildlife, as well as those areas determined by the KDWP to be essential for the conservation of any threatened or endangered species of wildlife.

The Kansas River, along the southern edge of the 354 Site, is a known roosting habitat for migratory bald eagles, which are state and federally listed as threatened. The occurrence of bald eagles along the Kansas River in the late fall, winter, and early spring correlates with the migration of waterfowl. Wintering eagles tend to concentrate around large impoundments, marshes, and rivers with nearby stands of mature trees and abundant fish, waterfowl, or other food supplies.

Piping plovers, which are state and federally listed as threatened, are rare migrants through Kansas and interior least terns, which are state and federally listed as endangered, are occasional summer residents in Kansas. Both species share similar life histories with the spring migration occurring in early to mid-May and the fall migration usually occurring between mid- or late July to early September. During migration stops, they spend most of their time searching for insects, crustaceans, and mollusks at the water's edge. Nesting pairs of piping plovers and interior least terns have been recorded along the Kansas River, but have not been observed along the river at Fort Riley (Keating, 2003, personal communication).

Because of the limited size of the 354 Site and the migratory nature of the bald eagle, piping plover, and interior least tern, the 354 Site represents a very small percentage of each species' range and habitat. No other state or federally listed threatened or endangered species known to occur within Riley County (See Section 2.0) has designated critical habitat on or adjacent to the 354 Site.

8.2.2 Potential Ecological Receptors and Exposure Pathways

Soil and groundwater were sampled at the 354 Site. These potentially impacted media may provide a contact point for ecological receptors. Exposure pathways for many species may not be completed for a particular medium due to life history characteristics or available habitat. The following discussion provides a description of the types of ecological receptors potentially exposed to each medium along with wildlife species-specific characteristics that are used later in the COPEC screening process.

Soils and groundwater were evaluated for the 354 Site because of the presence of plant and wildlife communities in the area. Exposure to surface water was not evaluated as a completed exposure pathway because analytical data collected from the Kansas River by the USGS in 2000 and 2001 do not indicate the presence of site-related chemicals in surface water (BMcD, 2000a; BMcD, 2000c; and BMcD, 2001g).

Minimal habitat for wildlife species, parking lots and mowed and maintained grassy lots with ornamental shrubs and trees, were present in the vicinity of Building 430. Plants were not present where spills and underground storage tanks associated with Buildings 367, 332, and 354 were located. These areas consisted of concrete and gravel. Only common wildlife species that are tolerant of human disturbances, including mice, mourning doves, squirrels, and eastern cottontails, are likely to intermittently inhabit the unpaved grassy areas in the vicinity of Building 430. Although these species are likely to only spend a fraction of their time in the vicinity of Building 430, they could potentially be exposed to soil contaminants. Wildlife species are not likely to inhabit the concrete and gravel parking lots and equipment storage areas surrounding Buildings 367, 332, and 354.

No completed exposure pathways were identified for the point bar area of the 354 Site because no site-related contaminants are expected in the point bar surface and subsurface soils. The main areas of concern at the 354 Site include spills and underground storage tanks associated with Buildings 430, 367, 332, and 354 in the terrace. Wildlife species that likely occur in the undeveloped point bar area of the 354 Site include opossum, raccoon, red fox, squirrels, eastern cottontail rabbit, white-tailed deer, garter snakes, American crow, mourning dove, and various species of mice and voles. Most of these species are likely to be found only along the Kansas River and in the undeveloped point bar area of the 354 Site. However, these species may occasionally venture into the terrace area of the 354 Site looking for food and potentially be exposed to soil contaminants in the vicinity of Building 430.

8.2.2.1 Soils

Parking lots and mowed and maintained grassy lots with ornamental shrubs and trees, were present in the vicinity of the areas of contamination associated with Building 430. Because of the presence of vegetation in unpaved areas in the vicinity of Building 430, the vegetation and soils in the areas of contamination associated with Building 430 are considered a potential exposure pathway. The areas of contamination in the vicinity of Buildings 367, 332, and 354 were primarily contained in paved and gravel parking lots in developed areas. No plants were in the immediate vicinity of the area of contamination and were not considered a potential exposure pathway in the vicinity of Buildings 367, 332, and 354. Similarly, soil organisms were also assumed to have incomplete exposure pathways because the areas of contamination in the vicinity of Buildings 367, 332, and 354 were located in paved and gravel parking lots.

Wildlife may be exposed to impacted soil via ingestion during feeding, burrowing, and/or cleaning activities. While some species may intentionally ingest soils that contain salts or other minerals, soil is typically only ingested incidentally and composes only a small percentage of the total material consumed. If incidentally ingested soil is impacted by COPECs, potential risks may exist. Although this is considered the primary terrestrial exposure pathway for this ecological evaluation, risk assessments that rely only on quantitative evaluation of incidental soil ingestion often overpredict the calculated level of risk (Tannenbaum, 2003a). In these instances, qualitative field observations may provide a better assessment of risk to plants and animals.

Since there are unpaved areas near Building 430, terrestrial receptors likely to be found in the developed environments of the terrace area were evaluated. Potential risk to ecological receptors from soil contaminants was assessed using measured analytical data for surface soil and subsurface soils from the terrace area of the 354 Site. The terrace area, which is developed with mowed and maintained lawns, contained only minimal flora and fauna and subsequently minimal opportunity for exposure of terrestrial receptors to surface soils. Additionally, much of the terrace area is covered by concrete or asphalt, making soil and groundwater inaccessible to ecological receptors. Soil samples were not collected from the point bar area because contaminant sources at the 354 Site are located on the terrace, to the north of the UPRR grade.

Representative species that were selected for evaluation of completed exposure pathways include short-tailed shrew, white-footed mouse, meadow vole, cottontail rabbit, red fox, and white-tailed deer. The white-footed mouse and cottontail rabbit are the only representative species that are likely occur at or in the vicinity of Buildings 430, 367, 332, and 354. The short-tailed shrew, meadow vole, red fox, and white-tailed deer likely occur only in the undeveloped areas of the point bar. Although, these species likely prefer the cover that the upland forest of the point bar provides, it was assumed that the short-tailed shrew, meadow vole, red fox, and white-tailed deer could wander from the point bar into the adjacent terrace area in search of food. Because of this possibility, the short-tailed shrew, white-footed mouse, meadow vole, cottontail rabbit, red fox, and white-tailed deer were selected for evaluation of completed exposure pathways. It is likely that most of these representative species do not occur or spend only a small amount of time in the vicinity of Buildings 430, 367, 332, and 354. Benchmarks for the preliminary chemicals of concern were available for mammals selected as representative species, but were not available for avian, reptile, and soil invertebrate species.

The soil exposure pathway was assumed to be limited to only those chemicals detected at depths less than four-ft bgs in the terrace area. This assumption was based on the life history characteristics of the selected terrestrial receptors and those receptors they represent. Terrestrial receptors, such as red foxes, voles, and white-footed mice, typically do not inhabit dens or burrows more than four-ft bgs (Schwartz and Schwartz, 1981).

8.2.2.2 Groundwater and Surface Water

Groundwater would only be available to those plant species capable of extending root systems to a sufficient depth below ground surface to access it. Monitoring well data indicated that groundwater in the point bar area of the 354 Site is greater than 12-ft bgs and ground water in the terrace varies between approximately ten-ft bgs to about 55-ft bgs. Trees and some shrubs could be capable of accessing groundwater at this depth, but they probably do not receive significant exposure to this medium. Based on direct impact with ecological receptors, groundwater would not require further evaluation. However, because groundwater generally discharges into the Kansas River and mixes with surface water, there is the potential of future impact to the benthic communities within the Kansas River. Potential risk to the Kansas River from groundwater contaminants was assessed using measured analytical data for groundwater from point bar monitoring wells.

Surface water is not considered as a separate medium in this ecological evaluation. Neither the terrace nor the point bar areas of the 354 Site contain any perennial or intermittent tributary streams of the Kansas River that are considered a completed pathway. Analytical data collected from the Kansas River by the USGS in 2000 and 2001 did not indicate the presence of site-related chemicals in surface water (BMcD, 2000a; BMcD, 2000c; and BMcD, 2001g).

8.3 ECOLOGICAL EVALUATION PROCESS

The following sections summarize the screening methodology used for this ecological evaluation.

8.3.1 Chemicals of Potential Ecological Concern

Ecological receptors, including plants and animals, are exposed to a variety of chemicals throughout their lives. Additionally, the needs of an individual receptor may change seasonally as a reflection of its various life functions, such as during egg production or other reproductive activities, hibernation, or migration. While many substances are essential for the health, survival, and well-being of the individual receptor, other naturally occurring and man-made substances may be of no value to the receptor, have no effect on the receptor, be beneficial, or have an adverse effect on the ability of the receptor to sustain itself. COPECs include those site-related chemicals detected at the 354 Site which have the potential to impact ecological receptors. The first step in determining a COPEC was to review the analytical data collected for surface soil and subsurface soils. A detailed discussion of the analytical data collected at the site is available in Section 5.0. For this risk assessment, COPECs were generally identified as those organic constituents that were detected in one or more samples from a given data set. Organic compounds were considered as preliminary COPEC if they were detected in one or more groundwater samples from monitoring wells on the point bar or in soil samples collected between the ground surface and four-ft bgs in unpaved areas in the vicinity of Buildings 430, and 354/332. As discussed in Section 5.2.1, metals in soil were eliminated from further consideration in the DETMWP and are not considered COPECs in this risk assessment.

The following chemicals were detected in soil samples and selected as preliminary COPECs for soils:

Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
Chrysene
Dibenz(a,h)anthracene
Fluoranthene
Indeno(1,2,3-cd)pyrene
Phenanthrene
Pyrene

The following chemicals were detected in groundwater samples and selected as preliminary COPECs for groundwater:

Benzene
Bromodichloromethane
Carbon tetrachloride
Chloroform
cis-1,2-DCE
Dibromochloromethane
TCE
PCE
trans-1,2-DCE
VC

Preliminary COPECs were further evaluated and compared to toxicological benchmarks in the preliminary semi-quantitative screening. The methods for further evaluation are discussed in the following sections.

8.3.1.1 Typical Wildlife Benchmark Screening Methodology

Based on the available habitat at the 354 Site, wildlife receptors potentially present were identified and compared to a list of species for which benchmarks have been established. Terrestrial receptors selected as representative species included the short-tailed shrew, white-footed mouse, meadow vole (close relative and surrogate for the prairie vole), cottontail rabbit, red fox, and white-tailed deer. The source of the benchmarks was the Oak Ridge National Laboratories' (ORNL) *Toxicological Benchmarks for Wildlife: 1996 Revision* (ORNL, 1996). Benchmarks for the preliminary chemicals of concern were not available for avian, reptile, and soil invertebrate species. Natural history characteristics (See Tables 8-1 and 8-2) used to calculate exposure were obtained from the *Wildlife Exposure Factors Handbook Vol. I & II* (USEPA, 1993a), *Preliminary Remediation Goals for Ecological Endpoints* (Efroymson et. al., 1997), *Toxicological Benchmarks for Wildlife: 1996 Revision* (ORNL, 1996), and *The Wild Mammals of Missouri* (Schwartz and Schwartz, 1981). If benchmarks were not available for a selected species, benchmarks for species representative of the various taxa and life histories expected to occur within the 354 Site were selected as surrogate benchmark values. All surrogate substitutions were noted in the evaluation.

The semi-quantitative screening was done using assumptions to calculate an ecological hazard quotient (EHQ). The EHQ is calculated using the estimated chemical intake to the benchmark. The calculation of the EHQ for wildlife is expressed mathematically by the following equation:

EHQ = Contaminant Dose Received from Soil (mg/kg/day)/Benchmark (mg/kg/day)

An EHQ less than 1.0 indicates the contaminant is unlikely to cause adverse effects to organisms; whereas, an EHQ greater than 1.0 indicates adverse effects to these receptors are possible and further evaluation may be warranted.

8.3.1.2 Preliminary Screening Method for Wildlife

The NOAEL was used as the benchmark for the preliminary screening. The NOAEL is the highest level of a stressor evaluated in a toxicity test or biological field survey that causes no statistically significant difference in effect compared with the controls or reference site (USEPA, 1997). Conservative assumptions were used in determining the preliminary exposure factors for the screening. Exposure factors are those natural history characteristics that might influence receptor exposure. The *Wildlife Exposure Handbook Vol. I & II* (USEPA, 1993) was the source of receptor exposure factors. If exposure factors for a specific receptor were not available from the above source, factors for species with similar life histories were substituted and referenced. For the preliminary screening, all contaminant exposure levels were assumed to equal the maximum detected concentrations. Benchmarks for the preliminary chemicals of concern were not available for avian, reptile, and soil invertebrate species.

Factors affecting wildlife exposure may include foraging range, bioavailability, and food ingestion rate. Conservative assumptions were made in the preliminary screening. Receptors were assumed to spend 100 percent of their time within the contaminated areas of the 354 Site, although the sites of contamination were in urbanized settings (a gravel lot, paved parking lots, and maintained grassy lots in the vicinity of buildings) and lacked suitable wildlife habitat. The contamination sources at the 354 Site were within soil and it was assumed that the ingestion route was by incidentally ingesting soil. The contaminated areas of the 354 Site were located in paved and gravel parking lots, and lacked any vegetation that could be a potential exposure pathway. It was also assumed that only a percentage of a representative species' diet consisted of soil and that the remaining portion of the diet consisted of other (typical) foodstuffs that were not contaminated. This assumption was based on the fact that the contaminated areas of the 354 Site were located in paved and gravel parking lots that lacked vegetation and available habitat for potential prey species. It was also assumed that all of the chemical ingested was absorbed into the organism's tissue (100 percent bioavailability for each chemical detected in the 354 Site).

For the wildlife receptors, the NOAEL was expressed in milligrams of contaminant per kilogram of body weight per day (mg/kg/day). The ingested dose received from the soil was calculated by multiplying the food ingestion rate, the fraction of soil in diet, and the maximum detected concentration. The ingested dose received from the soil was also expressed in mg/kg/day. The ingested dose received from the soil was divided by the weight normalized NOAEL to get the EHQ. If chemicals exceeded NOAEL benchmarks, they were considered COPECs and were retained for further evaluation.

8.3.2 Benthic Organisms Benchmark Screening Methodology

Benchmarks used for aquatic receptors were directly compared to maximum detected concentrations in groundwater from the monitoring wells in the point bar area of the 354 Site. This assumes that aquatic receptors (aquatic organisms in the Kansas River) are exposed to chemical concentrations found in groundwater. This is an extremely conservative approach and ignores the natural mixing that occurs when groundwater discharges into surface water. This approach also ignores the degradation and dispersion mechanisms that cause chemical concentrations to decrease as groundwater migrates away from the source areas. The benchmark sources are listed below in order of application preference. If a benchmark for a specific chemical was not available from the preferred source, the next available source was used according to the application preference. Although this evaluation is assessing potential impacts to benthic organisms, the benchmark preferences were based on the protection of all aquatic life.

- Kansas Surface Water Quality Criteria (KSWQC) – KSWQC are regulatory values that apply to all surface waters in Kansas regardless of classification (KSWQC, 1999). Several benchmark categories exist within the KSWQC, including aquatic life. Aquatic life benchmarks that provide protection from both acute and chronic exposure are available. The more protective chronic values were selected because these benchmarks were developed for the protection of all aquatic receptors and are not exclusively protective of aquatic macroinvertebrates or benthic organisms. Chronic values are generally lower and therefore represent a more conservative approach.

- National Ambient Water Quality Criteria (NAWQC) – The NAWQC are values for surface waters that may be adopted by states for regulatory purposes (ORNL, 1996a). Though both acute and chronic benchmark values are available, the chronic values were selected for this evaluation due to possible continuous exposure and the lower concentration representing a more conservative approach. As with the KSWQC, NAWQC are protective of all aquatic receptors and are not exclusively protective of aquatic macroinvertebrates or benthic organisms.

- USEPA Tier II Secondary Chronic Value – The Tier II Secondary Chronic Values are guidelines that were calculated by the USEPA using the methodology described by the USEPA's *Proposed Water Quality Guidance for the Great Lakes System* (ORNL, 1996a). These values were developed in a manner consistent with the NAWQC and are proposed by the USEPA for application to the Great Lakes. All receptors used to assess the benchmark endpoints were fish.

- National Recommended Water Quality Criteria (NRWQC) – NRWQC is a compilation of water quality criteria for various pollutants. These water quality criteria were developed for the protection of all aquatic receptors and are not exclusively protective of aquatic macroinvertebrates or benthic organisms (FR, 1998).

- Department of Energy ORNL Lowest Chronic Value for Daphnids – The values contained in this benchmark source represent the highest tested concentration of a specific chemical causing less than 20 percent reduction of growth, fecundity, and survivorship in a chronic test with a Daphnid species (ORNL, 1996a). Daphnid genera used in the development of these benchmarks included Daphnia, Ceriodaphnia, and Simocephalus. Daphnids are standard laboratory aquatic invertebrates commonly used to develop toxicity data. The Order Crustacea, which includes Daphnids, is generally more sensitive to environmental pollution than are true benthic organisms typically occurring in the Kansas River, such as Order Oligichaeta (bloodworms) and Order Diptera (midge flies and black flies) (KDWP, 1993). Daphnids do not typically occur in local riverine habitats such as the Kansas River, and they are not true benthic organisms. However, Daphnids are the most similar in life history to the chosen receptor, benthic organisms. Therefore, this database was chosen as a source for benchmarks. Benchmark values that are protective of Daphnids (aquatic macroinvertebrates) are also conservatively assumed to be protective of the less sensitive benthic organisms.

Potential ecological impacts to aquatic receptors are expressed mathematically in the following equation for calculating the EHQ for benthic organisms:

$$\text{EHQ} = \text{Contaminant Concentration Detected in Groundwater } (\mu g/L) / \text{Benchmark } (\mu g/L)$$

An EHQ less than 1.0 indicates the contaminant is unlikely to cause adverse effects to organisms; whereas, an EHQ greater than 1.0 indicates adverse effects to these receptors is possible and further evaluation may be warranted. If actual groundwater concentrations exceed the aquatic benchmark values, then further evaluation may be necessary to more realistically assess ecological impacts to aquatic receptors.

8.3.3 Vegetation Screening Methodology

An exposure pathway for plants is not present in the terrace area because contaminated areas in the vicinity of Buildings 430, 367, 332, and 354 are in paved and gravel equipment storage lots and the average depth of the groundwater in the terrace area varies between approximately ten-ft bgs to about 55-ft bgs. No contaminated soils associated with Buildings 430, 367, 332, and 354 are located in the point bar area of the 354 Site. Monitoring well data indicated that groundwater in the point bar area of the 354 Site is greater than 12-ft bgs. It is unlikely that plants within the 354 Site receive significant exposure to chemicals of concern associated with the contaminated areas in the vicinity of Buildings 430, 367, 332, and 354. Additionally, no benchmarks for plant species were available for the chemicals of concern. However, the plant communities within the 354 Site were assessed qualitatively, based on observations made by the BMcD biologists during the September 2002 site visit. Plant communities in the terrace and point bar areas of the 354 Site lacked any visible adverse effects such as large areas of stressed, dead, or dying plant associations.

8.3.4 Exceptions to Screening Methodology

Some chemicals, regardless of their concentrations or distribution, are included or excluded as COPECs due to individual toxicity characteristics. Chemicals such as biomagnifiers or bioaccumulators may become more concentrated and more detrimental as they pass through the food chain, regardless of their media concentration. Many chemicals may not have any ecotoxicity data available and alternative methods must be used to semi-quantitatively assess risk. All of these situations are exceptions to the screening methodology and are discussed in the following sections

8.3.4.1 Biomagnification

Chemicals that have the potential to biomagnify require evaluation regardless of their detected levels (USACE, 1996a). Biomagnification occurs when substances are ingested by organisms at low levels in the food chain and, because the substance is not metabolized, concentrations accumulate in organism tissue. Subsequent consumption of these organisms by others in the food chain may cause these higher trophic organisms, in turn, to retain the contaminant and the process repeats up the food chain. Higher trophic predators are especially susceptible to chemicals that biomagnify. Under such conditions, it is possible for the contaminant, even if present in very small amounts, to reach levels that can cause adverse effects in higher trophic species.

8.3.4.2 No Benchmarks Available

If benchmark values for the chosen species, chemicals, or media were not available, toxicity values for chemicals with similar characteristics with available data were used as surrogate data. All surrogate toxicity data are identified in the appropriate screening table. Based on the comparison of site data to benchmarks, the potential ecological risks were assessed. The chemicals detected in soils without benchmarks include benzo(a)anthracene, benzo(a)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. Toxicity information for benzo(a)pyrene was substituted as a surrogate benchmark for the PAHs without benchmarks. Bromodichloromethane, dibromochloromethane, and VC were the only chemicals detected in groundwater without benchmarks.

8.4 RISK CHARACTERIZATION

Risk characterization assesses the likelihood of adverse ecological effects associated with exposure to site contamination. The risk characterization combines the semi-quantitative evaluation with the qualitative assessment to conclude if significant risk to ecological receptors exists (USEPA, 1997). Although a benchmark screening approach is appropriate for some risk assessments, many risk assessments are not based on benchmark decisions (FR, 1996). Rather, ecological risk management decisions may depend on a more qualitative assessment of ecosystem integrity, including sustainability, resiliency, and biodiversity as observed during a field study (USEPA, 1997). Therefore, this ecological risk assessment will use a semi-quantitative (screening) as well as a qualitative (observable) process to characterize the potential for risk. The ecological risk characterization results are presented in the following sections.

If possible, a more qualitative assessment of potential risk was conducted. Any ecological clues as to potential risk were noted during field investigation. Observations were correlated to general ecological relationships as discussed in the previous sections.

8.4.1 Shallow Subsurface Soils in the 354 Site

The chemicals listed in Section 8.3.1 were detected in soils from zero- to four-ft bgs in unpaved areas in the vicinity of Building 430 and Building 354/332 in the 354 Site. As stated previously in Section 8.2.2, no soil samples were collected from the point bar area of the 354 Site. The point bar area does not contain sources of site-related contaminants that would result in a relevant exposure pathway for the terrestrial flora and fauna that inhabit the point bar area. None of the spills and underground storage tanks associated with Buildings 430, 367, 332, and 354 are in the point bar area. The short-tailed shrew, white-footed mouse, meadow vole (close relative and surrogate for the prairie vole), cottontail rabbit, red fox, and white-tailed deer were selected as the representative wildlife species that occur or are likely to occur in the 354 Site and may be transient visitors to the contaminated areas in the vicinity of Buildings 430, 367, 332, and 354. However, the white-tailed deer is not expected to frequent the terrace or have a completed exposure pathway with contamination in the terrace.

Benchmarks for all six representative wildlife species were screened against the maximum concentrations. The results of the preliminary wildlife benchmark screening for soils, presented in Table 8-3, indicate that the representative wildlife species received a minimal dose of PAHs from the soils. The calculated EHQ for each PAH indicates that the contaminants are unlikely to cause adverse effects to organisms and that further screening was not necessary. PAHs generally do not biomagnify through the food web, but can bioaccumulate (Roper et. al., 1994). The terrace area of the 354 Site has minimal habitat for wildlife species and likely does not have a pathway for the PAHs to bioaccumulate in the food web.

8.4.2 Comparison of Contaminant Concentrations in Groundwater to Benthic Organism Benchmarks

Current analytical data from monitoring wells located south of the UPRR corridor in the point bar area of the 354 Site were evaluated. It was assumed that, consistent with past data, COPEC concentrations in the point bar would be less than COPEC concentrations at the contamination source in the terrace area of the 354 Site. Groundwater velocities within the Kansas River alluvial aquifer are only five to ten percent of those for the terrace aquifer. These much lower groundwater velocities allow for more lateral dispersion to occur in the Kansas River alluvial aquifer. This results in plumes that are wider and less well defined than the plume in the terrace, which is much narrower. The overall effect of the lateral dispersion is a dilution of contaminant concentrations at the leading edge of the plume.

Maximum concentrations of chemicals detected in monitoring wells in the point bar area near the Kansas River were used as theoretical and conservative current exposure concentrations for benthic organisms. The chemicals detected are listed in Section 8.3.1. A comparison of current concentrations in groundwater to benthic organism benchmarks is presented in Table 8-3. Chronic aquatic life benchmarks were not available for bromodichloromethane and dibromochloromethane; however, they were detected infrequently and at very low concentrations. The maximum detected concentrations of VOCs in groundwater near the Kansas River were below the benchmarks used for this evaluation. VOCs tend not to bioaccumulate (accumulation of a pollutant in an organism) and show little tendency to biomagnify because they are readily metabolized by receptors (USACE, 1996a). Therefore, current conditions for VOCs at the facility are unlikely to pose appreciable risk to benthic organisms in the Kansas River.

8.5 PREDICTED FUTURE CONDITIONS AND POTENTIAL RISK

Chemicals were detected in soils and groundwater during the RI. Adverse ecological effects to terrestrial receptors (plants and animal communities) were not observed during field investigations conducted by BMcD biologists. The plant and wildlife communities within the 354 Site did not appear stressed or to exhibit adverse affects due to the detected contaminants. The quantity of toxin available for exposure to the ecological receptor becomes markedly less over time (Tannenbaum, 2003b). Chemical concentrations in soils and groundwater of the terrace and point bar areas of the 354 Site are expected to naturally degrade and decline in the future. An evaluation of fate and transport, including an evaluation of natural attenuation of the site-related constituents, is provided in Section 6.0. The potential exposure and any associated risk to wildlife species is expected to decrease over time.

8.6 UNCERTAINTIES

When evaluating the ecological risks, several inherent uncertainties exist. These uncertainties pertain to all aspects of the risk analysis. In order to evaluate the potential ecological risk, several assumptions must be made. Uncertainties associated with this ecological evaluation are presented in the following assumptions.

- All ecological receptors, including plants, wildlife, fisheries, threatened and endangered species, and sensitive natural communities, are identified.
- All chemicals are identified.
- Reported chemical concentrations are accurate.
- Benchmark values developed for benzo(a)pyrene are suitable surrogates for other PAHs without known benchmark values.
- Chemicals identified do not interact in a synergistic manner.
- Relevant exposure pathways have been identified.
- Wildlife exposure values under laboratory conditions are applicable to natural conditions.
- Benchmark values developed for representative benthic organisms are applicable to other organisms occurring in the Kansas River.
- Wildlife exposure values are applicable to species of similar size and life history.
- Ingestion rates for representative species are accurate.
- Based on information gathered during the September10, 2002 site visit impacts to ecological receptors, plant communities, and soil organism communities can be assessed qualitatively.
- The facility is used by certain wildlife species for at least some portion of their lives and that use is a reflection of the percentage of the species range composed by the area.

- Percentage of soil ingested by ecological receptors is related to the percentage of time receptors spend within the contaminated areas of the 354 Site in the vicinity of Buildings 430, 367, 332, and 354.
- The point bar area does not contain site-related contaminants that result in a relevant exposure pathway for the terrestrial flora and fauna that inhabit the point bar area.
- Metals detected in soils and groundwater are present at background levels as discussed in Section 5.0 of the RI Report.

When evaluating exposure, probable scenarios are developed to estimate conditions and duration of exposure with COPECs. Scenarios are based on observations or assumptions about plant and wildlife populations that could result in direct exposure. To prevent underestimation of any risk, scenarios incorporate exposure levels and durations at or near the top end of the range of probable values.

Terrestrial receptors, including plants and soil organisms, were qualitatively assessed. The results of the qualitative risk characterization were based on the lack of any visible adverse effects within the plant and animal communities of the 354 Site. The plant and wildlife communities within the 354 Site did not appear stressed or to exhibit adverse affects due to the detected contaminants. Similarly, the aquatic communities (freshwater mussels and minnows) within the Kansas River at the southern end of the site did not appear to be stressed or to exhibit adverse affects due to the detected contaminants. The results of the qualitative risk characterization determined that the ecological receptors in the vicinity of the 354 Site are not significantly at risk.

For this ecological risk assessment, it was assumed the contaminant levels used in the exposure calculations remained at the maximum detected concentrations throughout the exposure period with no reduction due to chemical dilution, depletion, or degradation. It was also assumed that wildlife and benthic organisms are exposed 100 percent of the time to the contaminants detected at the 354 Site. These are conservative assumptions and most likely results in overestimation of exposure. The average chemical concentrations across the associated exposure area are almost certainly lower than the maximum values used in this assessment and will be diluted, depleted, or degraded over time. Similarly, it is unlikely that any of the representative wildlife species that were selected or any wildlife species that inhabit the Fort Riley base would be more than transient visitors to the contaminated areas within the vicinity of Buildings 430, 367, 332, and 354. The associated uncertainty is that actual risk is much less than estimated.

Inorganic metal concentrations of arsenic, barium, chromium, and lead were detected in groundwater samples collected from the point bar area of the 354 Site. The metals detected in the groundwater samples are assumed to be present at background levels as discussed in Section 5.0 of the RI Report and are not part of the chemicals of concern detected in the vicinity of Buildings 430, 367, 332, and 354. Detected barium concentrations should not pose a threat to animals within the 354 Site since most of the barium that is ingested is eliminated in feces and urine (ATSDR, 1992). The remaining barium that is not eliminated by the organism minimally bioaccumulates in the bones and teeth. Similarly, the chromium detected in the ground water should not pose a threat to wildlife in the area since it does not bioaccumulate in aquatic organisms or aquatic food chains (ATSDR, 2000a). Plants and animals may bioconcentrate lead, but lead is not biomagnification in terrestrial or aquatic food chains (ATSDR, 1999). Due to the strong absorption of lead to soil organic matter, the bioavailability of lead in soils and groundwater decreases as the pH, water hardness, and organic matter content of the soil increase (ATSDR, 1999). In aquatic organisms, lead concentrations are usually highest in benthic organisms and algae, and lowest in upper trophic level predators, such as carnivorous fish (ATSDR, 1999).

Although arsenic was detected in the majority of point bar monitoring wells, it was only detected in one terrace monitoring well. The known sources of contamination are located on the terrace area. If arsenic was a site-related contaminant, it should be present in groundwater samples taken from the terrace monitoring wells; however, arsenic was not detected in monitoring wells in the vicinity of Buildings 430, 367, 332, and 354. Additionally, the concentrations of arsenic vary throughout the point bar, and only five of the 15 monitoring wells with arsenic detections (out of a total of 22 point bar monitoring wells) were above the FFTA-MAAF background concentration. Given the absence of arsenic in groundwater near the source areas and the varying concentrations across the point bar, it is likely that arsenic is present at background concentrations. Wildlife, including non-predatory species, may bioaccumulate arsenic from the surrounding water or from feeding on fish and benthic organisms (ATSDR, 2000). However, background arsenic concentrations in terrestrial flora and fauna, birds, and freshwater biota are usually less than one mg/kg fresh weight (Eisler, 1988). Since freshwater mussels and minnows were observed feeding in the river, it is also likely that ecological receptors on or in the vicinity of the 354 Site are not significantly at risk from by the inorganic metals detected in the groundwater samples.

8.7 SUMMARY

The potential for ecological risk from exposure to chemicals at the 354 Site was considered for soil and groundwater media. Based upon observed Site conditions, it was concluded that flora and fauna could be exposed to site-related constituents through direct contact and/or ingestion of soil and groundwater.

COPECs identified included PAHs in soils and VOCs in groundwater. The impacts of the COPECs upon potential receptors were assessed qualitatively and by a quantitative screening.

The site was evaluated for the presence of ecological receptors and completed ecological exposure pathways. Ecological receptors and/or completed exposure pathways were identified within the terrace area (main operational portion) of the 354 Site. Completed exposure pathways for terrestrial ecological receptors were not identified in the point bar area of the 354 Site because the contaminant sources at the 354 Site include spills and underground storage tanks associated with Buildings 430, 367, 332, and 354 in the terrace area. None of the spills and underground storage tanks associated with these buildings are in the point bar area. Since habitat is limited and human activity makes the area unattractive for the establishment of natural communities, soil and groundwater in the terrace area of the 354 Site were not evaluated due to a lack of completed exposure pathways. Therefore, COPECs at this location present no ecological risk. Groundwater was evaluated in the point bar area of the Site due to the aquatic communities observed in the Kansas River.

Potentially completed exposure pathways were identified at the 354 Site, and these pathways were evaluated. Representative terrestrial receptors (short-tailed shrew, white-footed mouse, meadow vole, cottontail rabbit, red fox, and white-tailed deer) were assessed semi-quantitatively. The preliminary screening did not provide any indications of adverse ecological effect from exposure to soil contamination. All other terrestrial receptors, including plants and soil organisms, were qualitatively assessed and determined to exhibit no adverse effects. The qualitative risk characterization was based on the lack of any visible adverse effects within the plant and animal communities of the 354 Site. Based on the results of the semi-quantitative and qualitative evaluations of soil contaminants, ecological risk to terrestrial flora and fauna inhabiting the 354 Site is expected to be insignificant. Additionally, protected species (See Table 2-5) are unlikely to experience adverse effects due to incidental contact with contaminated soil. The future presence of any protected species in the contaminated areas at the 354 Site is likely to be transitory.

Potential for risk to benthic organisms inhabiting the Kansas River was assessed quantitatively. Existing chemical concentrations in groundwater near the Kansas River (as measured in samples collected from monitoring wells within the point bar area of the 354 Site) were compared to benchmark values for benthic organisms. The maximum detected concentrations of VOCs in groundwater near the Kansas River were below the benchmarks used for this evaluation. Therefore, current VOC concentration conditions within the point bar area of the 354 Site are unlikely to pose appreciable risk to benthic organisms in the Kansas River.

As stated in Section 8.2.1, critical habitat for the bald eagle, piping plover, and interior least tern occurs along the Kansas River at the southern edge of the 354 Site. Bald eagles are migratory and known to winter along the Kansas River. Both the piping plover and the interior least tern are seasonal inhabitants along the Kansas River. Although the food gathered along the Kansas River may make up a significant dietary component of wintering bald eagles, and piping plovers and interior least terns, the approximate one-mile stretch of the Kansas River in the 354 Site would only account for approximately one-quarter to one-half of each species' foraging range. Only minimal exposure to arsenic would be expected due to the short amount of time these species spend along the Kansas River at the 354 Site and the relatively low concentrations detected in the point bar north of the Kansas River. Risk to bald eagles, piping plovers, and interior least terns in the vicinity of the 354 Site are most likely insignificant.

Risks to other state and federally listed species known to occur in Riley County are also likely to be insignificant.

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9.0 CONCLUSIONS

The purpose of this RI Report is to document the evaluation of current conditions as they pertain to potential threats to human health and the environment associated with the 354 Area Solvent Detections, Fort Riley, Kansas. Included within this report are characterization of the nature and extent of contamination, an evaluation of the fate and transport of contaminants, and human health and ecological risk assessments.

9.1 CONCEPTUAL SITE MODEL

The primary chlorinated solvent source appears to be located immediately east of Building 367. This source appears to be principally PCE, based on both soil and groundwater data. TCE and cis-1,2-DCE are present as well, but at significantly lower levels. Secondary chlorinated solvent sources may exist in the vicinity of Building 332 and the DPW Compound, but the evidence for this is not firm. There are sources of BTEX contamination in the vicinity of Building 332, the former Building 354, and along the UPRR grade, based on both soil and groundwater evidence.

Chlorinated solvents, including PCE, TCE, cis-1,2-DCE, and CCl_4, have been detected in groundwater from both the terrace and Kansas River alluvial aquifers. The highest concentrations of these compounds have been detected in groundwater samples collected from the terrace aquifer immediately east and downgradient of Building 367. These compounds are also present in the Kansas River alluvial aquifer, but at significantly lower concentrations. Petroleum compounds are present locally, mainly in samples collected from monitoring wells at and immediately south of the DPW Compound. Although very low concentrations of cis-1,2-DCE have been detected at monitoring wells immediately adjacent to the Kansas River, contaminants have not been detected in surface-water samples collected from the Kansas River.

Chlorinated solvent contamination is transported south within the terrace aquifer to the Kansas River alluvial aquifer. Advection appears to be the dominant transport process. Adsorption is probably also contributing significantly to the reduction of PCE mass in groundwater, with volatilization possibly playing a minor role. Based on an evaluation of NA parameters within the terrace aquifer and the contaminant chemistry, it appears that little or no biotransformation of chlorinated solvents is occurring. DO, ORP, and nitrate levels are high, while Fe (II) levels remain low, all suggesting an environment unsuitable for reductive dechlorination. This is confirmed by high levels of PCE within the groundwater, and modest amounts of the daughter products (TCE and cis-1,2-DCE) present.

Once the contaminant plume intersects the Kansas River alluvial aquifer, environmental conditions change. The direction of transport becomes easterly, moving with the general direction of flow of the Kansas River. Dispersion becomes more significant, relative to advection, as groundwater flow velocities tend to be only one-tenth of those within the terrace aquifer. Within the alluvial aquifer, conditions improve for reductive dechlorination. DO, ORP, and nitrate levels drop significantly, as Fe (II) levels increase, suggesting that environmental conditions improve greatly for reductive dechlorination. In addition, PCE disappears shortly after entering the alluvial aquifer, to be replaced with TCE, and finally cis-1,2-DCE.

cis-1,2-DCE is less amenable to dechlorination in an anaerobic reducing environment, compared to PCE and TCE. In this system, it appears that once the degradation pathway reaches cis-1,2-DCE, the dechlorination process slows, leaving cis-1,2-DCE to be further attenuated by advection and dispersion. The absence of VC throughout the plume and ethane/ethene also points to the stalling of the reductive dechlorination process at cis-1,2-DCE. Another factor influencing reductive dechlorination is the availability of primary carbon sources to act as electron donors. BTEX is present in groundwater in the area where the plume impacts the Kansas River alluvial aquifer, but is not present downgradient. These organics can serve as a primary substrate for microorganisms facilitating reductive dechlorination. As BTEX is degraded, the reduction of chlorinated substances stalls, leaving cis-1,2-DCE. TOC levels are below the 20 mg/L threshold considered optimal for reductive dechlorination, which may inhibit the continued dechlorination of cis-1,2-DCE.

Arsenic, barium, chromium, lead, and mercury were detected in the groundwater at the 354 Site. Only arsenic and lead were detected at concentrations in excess of USEPA MCL or action level (in the case of lead). These detections were all located within or immediately adjacent to the Kansas River alluvial aquifer. The lack of detections in terrace monitoring wells suggested that these were not site-related contaminants. Because the groundwater within the point bar is not considered useable as a drinking water source and is generally too deep to be directly contacted, metals in groundwater were not evaluated quantitatively as part of the human health risk assessment. Arsenic, barium, cadmium, chromium, and lead were detected in soils at the 354 Site. Metals in soils were generally detected at concentrations below regional background levels, with the exception of lead. However, the detected concentrations of lead in soil were below regulatory screening levels. Since most metals in soil were detected at concentrations below background, and the detected concentrations of all metals were below regulatory screening levels, no metals in soil were retained as COPCs. However, in accordance with recent USEPA guidance and USACE policy, an evaluation of potential human health risks associated with exposure to background levels of metals was added to the discussion of uncertainties. No specific sources for metals have been identified at the 354 Site; however, tetraethyl lead was once a common fuel additive.

9.2 RISK ASSESSMENT

9.2.1 Summary of Human Health Risk

The potential for human health risk from exposure to chemicals at the 354 Site was considered for the soil, groundwater, and air media. COPCs at the 354 Site include the following: PCE and related compounds (TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE and vinyl chloride), 1,1,2-trichloroethane, CCl_4 and related compound chloroform, BTEX petroleum constituents, acetone, and carbon disulfide. Because there are three distinct areas of contamination at the Site, risk was evaluated separately for the Building 367 Area, the Building 354/332/DPW Compound Area, and the Building 430 Area. Based on observed 354 Site conditions, it was concluded that current and potential future populations could be exposed to site-related constituents through direct contact with soil and/or inhalation of chemical vapors from soil, soil gas, and groundwater. Potential intakes of the COPCs were calculated using standard USEPA equations for intake from ingestion, dermal contact, and inhalation of contaminants. Cancer and noncancer risks were calculated for the following scenarios: current indoor worker exposure to vapors from soil or groundwater (Building 367 and Building 354/332/DPW Compound Areas); future utility excavation worker exposure to impacted soil and vapors from soil or groundwater while excavating (Building 367 Area); current groundskeeper exposure to impacted soil and vapors from soil or groundwater while mowing (Building 354/332/DPW Compound Area); and current child resident exposure to impacted soil and vapors (Building 430 Area) from soil gas or groundwater.

For exposure concentrations, 95 percent UCLs of the mean were calculated assuming log normally distributed soil and groundwater data. Exposure concentrations represented the lower of either the 95 percent UCL or maximum detected concentration. In the Building 367 and Building 430 Areas, the exposure concentrations were predominantly represented by 95 percent UCLs, whereas maximum detected concentrations were primarily used in the Building 354/332/DPW Compound Area. For exposure concentrations that might be experienced in the future by a utility excavation worker, soil chemical concentrations under current conditions were assumed. Vapor concentrations used in the exposure calculations were determined by modeling contaminant partitioning from soil and/or groundwater to soil gas, migration of soil gas to the surface, and dilution in the breathing zone at the receptor point. Since vapor migration is a competitive process, it would be duplicative to evaluate inhalation of vapors from both media. Therefore, the higher of the two vapor concentrations was used in the vapor inhalation intake calculations.

The results of the risk characterization indicate that the excess cancer risks for all populations evaluated were below the USEPA's allowable levels. The hazard indices for the populations assessed were also below the USEPA's level of concern.

Uncertainties in the risk assessment process were evaluated. It was concluded that, when combined, the uncertainty associated with each step most likely resulted in a conservative overestimate of risk, particularly in the Building 354/332/DPW Compound Area where risk calculations were based primarily on maximum chemical concentrations.

9.2.2 Summary of Ecological Risk

The potential for ecological risk from exposure to chemicals at the 354 Site was considered for soil and groundwater media. Based upon observed Site conditions, it was concluded that flora and fauna could be exposed to site-related constituents through direct contact and/or ingestion of soil and groundwater. COPECs identified included PAHs in soils and VOCs in groundwater. The impacts of the COPECs upon potential receptors were assessed qualitatively and by a quantitative screening.

The site was evaluated for the presence of ecological receptors and completed ecological exposure pathways. Ecological receptors and/or completed exposure pathways were identified within the terrace area (main operational portion) of the 354 Site. Completed exposure pathways for terrestrial ecological receptors were not identified in the point bar area of the 354 Site because the contaminant sources at the 354 Site include spills and underground storage tanks associated with Buildings 430, 367, 332, and 354 in the terrace area. None of the spills and underground storage tanks associated with these buildings are in the point bar area. Since habitat is limited and human activity makes the area unattractive for the establishment of natural communities, soil and groundwater in the terrace area of the 354 Site were not evaluated due to a lack of completed exposure pathways. Therefore, COPECs at this location present no ecological risk. Groundwater was evaluated in the point bar area of the Site due to the aquatic communities observed in the Kansas River.

Potentially completed exposure pathways were identified at the 354 Site, and these pathways were evaluated. Representative terrestrial receptors (short-tailed shrew, white-footed mouse, meadow vole, cottontail rabbit, red fox, and white-tailed deer) were assessed semi-quantitatively. The preliminary screening did not provide any indications of adverse ecological effect from exposure to soil contamination. All other terrestrial receptors, including plants and soil organisms, were qualitatively assessed and determined to exhibit no adverse effects. The qualitative risk characterization was based on the lack of any visible adverse effects within the plant and animal communities of the 354 Site. Based on the results of the semi-quantitative and qualitative evaluations of soil contaminants, ecological risk to terrestrial flora and fauna inhabiting the 354 Site is expected to be insignificant. Additionally, protected species are unlikely to experience adverse effects due to incidental contact with contaminated soil. The future presence of any protected species in the contaminated areas at the 354 Site is likely to be transitory.

Potential for risk to benthic organisms inhabiting the Kansas River was assessed quantitatively. Existing chemical concentrations in groundwater near the Kansas River (as measured in samples collected from monitoring wells within the point bar area of the 354 Site) were compared to benchmark values for benthic organisms. The maximum detected concentrations of VOCs in groundwater near the Kansas River were below the benchmarks used for this evaluation. Therefore, current VOC concentration conditions within the point bar area of the 354 Site are unlikely to pose appreciable risk to benthic organisms in the Kansas River.

Critical habitat for the bald eagle, piping plover, and interior least tern occurs along the Kansas River at the southern edge of the 354 Site. Bald eagles are migratory and known to winter along the Kansas River. Both the piping plover and the interior least tern are seasonal inhabitants along the Kansas River. Although the food gathered along the Kansas River may make up a significant dietary component of wintering bald eagles, and piping plovers and interior least terns, the approximate one-mile stretch of the Kansas River in the 354 Site would only account for approximately one-quarter to one-half of each species' foraging range. Only minimal exposure to arsenic would be expected due to the short amount of time these species spend along the Kansas River at the 354 Site and the relatively low concentrations detected in the point bar north of the Kansas River. Risk to bald eagles, piping plovers, and interior least terns in the vicinity of the 354 Site are most likely insignificant.

Risks to other state and federally listed species known to occur in Riley County are also likely to be insignificant.

9.3 CONCLUSIONS

In summary, chlorinated solvent contamination at the 354 Site is located primarily within soils and groundwater of the terrace area. Soil contamination does exceed KDHE RSK levels (residential) for the soil to groundwater pathway and groundwater contamination levels are in excess of the USEPA MCLs. The terrace aquifer is not likely to ever be used as a source of drinking water. Contaminants are present within the Kansas River alluvial aquifer; however, it appears that NA processes are actively degrading chlorinated solvent contamination in this area. Only low levels of chlorinated solvents have been detected in monitoring wells immediately adjacent to the Kansas River. CCl_4 is present at very low concentrations at the site. There is no risk to either human health or ecological receptors at the 354 Site.

* * * * * *

10.0 REFERENCES

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Tables

Table 2-1
Bedrock Elevations
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Points	Ground Surface Elevation (feet)	Depth to Bedrock (feet)	Bedrock Elevation (feet)
B01	1095.2	39.0	1056.2
B02	1095.4	37.7	1057.7
B03	1095.6	39.4	1056.2
B04	1096.1	40.6	1055.5
B05	1096.3	39.2	1057.1
B06	1093.1	36.5	1056.6
B07	1095.2	38.8	1056.4
B08	1095.8	39.0	1056.8
B09	1095.7	39.0	1056.7
B10	1094.7	37.4	1057.3
B10A	1088.7	30.0	1058.7
B11	1093.8	36.9	1056.9
B12	1093.6	36.6	1057.0
B13	1092.0	35.0	1057.0
B14	1093.6	36.7	1056.9
B15	1092.1	35.0	1057.1
B16	1091.1	34.6	1056.5
B17	1091.6	35.0	1056.6
B18	1091.0	34.3	1056.7
B19	1090.4	33.5	1056.9
B20	1085.5	30.0	1055.5
B21	1089.5	33.0	1056.5
B22	1090.1	33.6	1056.5
B23	1088.6	32.0	1056.6
B24	1088.0	30.4	1057.6
B25	1087.5	30.8	1056.7
B26	1081.9	25.3	1056.6
B27	1077.7	21.4	1056.3
B29	1086.7	30.3	1056.4
B30	1088.1	31.5	1056.6
B31	1087.0	30.4	1056.6
B32	1082.7	29.0	1053.7
B35	1072.4	13.3	1059.1
B36	1078.8	22.0	1056.8
B36A	1083.1	26.5	1056.6
B38	1081.8	24.3	1057.5
B39	1080.4	22.4	1058.0
B40	1070.2	14.5	1055.7
B42	1069.0	13.5	1055.5
B47	1065.0	7.9	1057.1
B48	1071.9	15.2	1056.7
B50	1068.9	12.5	1056.4
B52	1070.2	13.5	1056.7
B54	1065.1	8.3	1056.8
B55	1073.7	17.5	1056.2
B57	1069.4	12.6	1056.8
B59	1067.4	18.9	1048.5
B61	1065.6	9.6	1056.0
B62	1064.8	24.8	1040.0

Sample Points	Ground Surface Elevation (feet)	Depth to Bedrock (feet)	Bedrock Elevation (feet)
B64	1063.4	23.1	1040.3
B66	1063.1	22.6	1040.5
B68	1083.4	27.3	1056.1
B70	1074.0	18.0	1056.0
B71	1076.8	21.0	1055.8
B72	1076.4	19.0	1057.4
B73	1076.4	21.0	1055.4
B74	1093.0	36.2	1056.8
B75	1098.8	42.4	1056.4
B76	1083.3	25.6	1057.7
B77	1078.6	21.0	1057.6
B78	1065.6	8.6	1057.0
B79	1062.6	22.4	1040.2
B80	1062.9	40.6	1022.3
B81	1063.8	39.0	1024.8
B82	1063.8	32.6	1031.2
B83	1079.3	20.6	1058.7
B84	1092.4	37.9	1054.5
B85	1080.1	23.0	1057.1
B86	1097.5	40.7	1056.8
B88	1085.2	28.4	1056.8
B89	1101.7	43.5	1058.2
B90	1102.7	42.1	1060.6
B91	1100.1	44.5	1055.6
B93	1097.7	41.7	1056.0
B94	1105.4	47.4	1058.0
B95	1095.1	38.0	1057.1
B98	1108.8	52.7	1056.1
B99	1110.5	56.7	1053.8
B100	1112.1	55.2	1057.0
B101	1111.1	54.0	1057.1
B103	1109.7	54.4	1055.3
B104	1112.3	55.5	1056.9
B105	1109.1	54.0	1055.1
B107	1108.3	53.2	1055.2
B108	1113.1	56.4	1056.8
B109	1106.3	48.6	1057.6
B112	1113.9	57.0	1056.9
B113	1076.8	25.0	1051.8
B114	1076.2	20.3	1055.9
B115	1076.8	16.6	1060.2
B116	1077.2	20.2	1057.0
B117	1078.6	20.9	1057.7
B118	1080.8	25.7	1055.1
B119	1088.2	32.4	1055.8
B120	1091.5	34.9	1056.6
B121	1097.6	41.3	1056.3
B122	1084.9	27.6	1057.3
B123	1081.4	24.5	1056.9

Table 2-1 (continued)
Bedrock Elevations
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Points	Ground Surface Elevation (feet)	Depth to Bedrock (feet)	Bedrock Elevation (feet)
B124	1078.0	20.3	1057.8
B125	1076.1	18.0	1058.1
B126	1087.2	30.0	1057.3
B127	1086.0	31.0	1055.0
B128	1076.6	20.0	1056.6
B129	1075.2	17.8	1057.5
B130	1073.0	16.0	1057.0
B131	1088.4	31.4	1057.0
B132	1074.6	20.9	1053.7
B133	1071.9	15.0	1056.9
B134	1070.9	14.0	1056.9
B136	1065.3	9.8	1055.6
B137	1066.4	10.0	1056.4
B138	1066.2	11.0	1055.2
B140	1066.0	9.1	1056.9
B143	1063.1	40.5	1022.6
B145	1063.1	35.7	1027.5
B147	1063.8	30.0	1033.8
B150	1094.0	38.3	1055.7
B151	1095.0	38.8	1056.2
B152	1095.8	38.5	1057.3
B153	1093.1	33.4	1059.7
B154	1094.0	37.5	1056.5
B155	1094.5	38.0	1056.5
B156	1092.3	35.5	1056.8
B157	1093.1	35.8	1057.3
B158	1093.7	33.0	1060.7
B159	1095.1	37.8	1057.3
B160	1095.6	35.7	1059.9
B161	1095.4	38.3	1057.1
B162	1095.2	38.5	1056.7
B163	1094.9	38.1	1056.8
B164	1094.9	40.0	1054.9
B165	1091.9	36.5	1055.4
B166	1089.6	31.5	1058.1
B167	1089.8	32.0	1057.8
B168	1088.7	31.8	1056.9
B169	1087.6	31.5	1056.1
B170	1087.9	31.9	1056.0
B171	1087.4	31.8	1055.6
B172	1085.7	31.5	1054.2
B173	1081.0	24.0	1057.0
B175	1112.5	55.2	1057.3
B177	1109.6	53.4	1056.2
B181	1113.0	56.5	1056.5
B182	1111.1	53.3	1057.8
B184	1106.9	47.8	1059.1
B188	1119.9	61.7	1058.2
B190	1121.8	63.9	1057.9

Sample Points	Ground Surface Elevation (feet)	Depth to Bedrock (feet)	Bedrock Elevation (feet)
B191	1121.5	62.9	1058.6
B192	1121.3	62.9	1058.4
B194	1120.2	62.7	1057.5
B196	1116.3	59.6	1056.7
B197	1114.2	58.6	1055.6
B198	1112.0	54.9	1057.1
B202	1099.4	23.0	1076.4
B203	1099.4	32.5	1066.9
B204	1097.5	32.0	1065.5
B205	1094.1	30.3	1063.8
B206	1082.2	26.5	1055.7
B207	1085.1	27.7	1057.4
B210	1118.6	60.9	1057.7
B212	1119.8	61.7	1058.1
B213	1118.8	63.7	1055.1
B214	1118.3	62.7	1055.6
B215	1117.4	54.5	1062.9
B216	1116.0	59.3	1056.7
B217	1116.3	59.2	1057.1
B218	1114.2	57.9	1056.3
B219	1110.2	53.4	1056.8
B220	1107.2	52.4	1054.8
B221	1103.8	44.0	1059.8
B222	1100.6	43.7	1056.9
B224	1115.3	58.0	1057.3
B226	1113.0	61.0	1052.0
B230	1114.7	58.0	1056.7
B232	1112.1	57.0	1055.1
B235	1116.0	58.0	1058.0
B241	1115.7	64.0	1051.7
B241A	1116.2	61.0	1055.2
B242	1114.8	60.0	1054.8
B243	1113.6	52.0	1061.6
B247	1116.0	58.0	1058.0
B248	1115.4	57.0	1058.4
B252	1115.7	58.0	1057.7
B253	1114.8	63.0	1051.8
B254	1113.4	62.0	1051.4
B258	1115.9	61.0	1054.9
B259	1115.2	57.0	1058.2
B263	1109.3	49.0	1060.3
B267	1111.3	55.0	1056.3
B393	1119.8	62.0	1057.8
B398	1118.7	62.0	1056.7
B403	1116.6	61.0	1055.6
B696	1105.1	28.7	1076.4
B697	1091.4	30.0	1061.4
B698	1085.9	30.0	1055.9
B699	1078.5	21.4	1057.1

Table 2-1 (continued)
Bedrock Elevations
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Sample Points	Ground Surface Elevation (feet)	Depth to Bedrock (feet)	Bedrock Elevation (feet)
B700	1074.0	16.0	1058.0
B701	1069.6	13.6	1056.0
B702	1076.9	20.0	1056.9
B703	1081.5	24.0	1057.5
B704	1080.5	24.0	1056.5
B709	1118.3	60.0	1058.3
B710	1119.9	61.0	1058.9
B711	1121.9	63.0	1058.9
B712	1124.0	61.3	1062.7
B713	1125.5	55.0	1070.5
B714	1059.6	48.0	1011.6
B719	1063.1	51.0	1012.1
B721	1064.3	51.0	1013.3
B723	1063.6	55.0	1008.6
B725	1063.5	58.6	1004.9
B752	1110.7	55.0	1055.7
B753	1103.9	50.5	1053.4
B754	1102.7	47.0	1055.7
B755	1095.6	40.0	1055.6
B756	1090.2	36.0	1054.2
B757	1087.0	32.0	1055.0
B758	1102.0	46.8	1055.2
B759	1096.6	39.8	1056.8
B760	1092.5	37.5	1055.0
B761	1089.3	34.6	1054.7
B762	1087.5	32.5	1055.0
B763	1097.6	40.5	1057.1
B764	1093.4	37.0	1056.4
B765	1085.7	29.0	1056.7
B766	1081.4	24.0	1057.4
B767	1126.8	43.6	1083.2
B768	1119.2	54.5	1064.7
B769	1123.3	57.9	1065.4
B770	1125.1	57.0	1068.1
B771	1117.2	46.9	1070.3
B773	1136.7	63.6	1073.1
B776	1130.6	49.4	1081.2
B777	1128.4	65.4	1063.0
B778	1117.8	56.2	1061.6
B779	1103.4	32.2	1071.2
B780	1108.1	44.9	1063.2
B781	1097.4	69.0	1028.4
B783	1128.2	59.9	1068.3
B784	1127.2	63.5	1063.7
B787	1132.3	77.1	1055.2
B788	1130.2	76.4	1053.8
B789	1127.7	68.5	1059.2
B790	1125.7	62.9	1062.8
B791	1122.3	65.8	1056.5

Sample Points	Ground Surface Elevation (feet)	Depth to Bedrock (feet)	Bedrock Elevation (feet)
B792	1117.6	51.0	1066.6
B793	1119.8	53.6	1066.2
B794	1115.8	54.5	1061.3
B795	1113.2	49.2	1064.0
B796	1103.6	38.2	1065.4
B797	1098.6	41.0	1057.6
B798	1096.4	39.0	1057.4
B799	1125.1	61.9	1063.2
B800	1123.3	61.6	1061.7
B803	1125.4	63.9	1061.5
B804	1124.7	62.6	1062.1
B805	1122.6	67.4	1055.2
B806	1121.1	63.0	1058.1
B807	1115.5	67.0	1048.5
B808	1114.5	51.8	1062.7
B809	1113.8	52.5	1061.3
B810	1109.4	51.0	1058.4
B811	1089.4	29.5	1059.9
B812	1087.5	32.0	1055.5
B815	1118.7	54.0	1064.7
B816	1116.1	59.0	1057.1
B817	1124.1	68.5	1055.6
B818	1121.3	65.5	1055.8
B819	1118.5	59.5	1059.0
B820	1116.0	63.5	1052.5
B821	1114.2	57.0	1057.2
B822	1112.6	61.0	1051.6
B823	1104.0	45.0	1059.0
B824	1101.4	43.5	1057.9
B825	1101.1	46.5	1054.6
B826	1098.7	41.5	1057.2
B827	1091.9	35.0	1056.9
B828	1084.3	32.0	1052.3
B830	1108.0	52.0	1056.0
B831	1101.7	47.0	1054.7
B832	1109.3	64.3	1045.0
B833	1102.1	49.0	1053.1
B834	1098.6	43.5	1055.1
B835	1097.6	44.5	1053.1
B836	1101.4	41.8	1059.6
B837	1100.8	44.8	1056.0
B838	1095.9	42.0	1053.9
B839	1100.9	42.9	1058.0
B840	1107.8	48.5	1059.3
B841	1101.8	44.1	1057.7
B842	1095.4	41.5	1053.9
B843	1091.8	36.2	1055.6
B887S	1126.3	67.5	1058.8
B888S	1125.9	67.5	1058.4

Table 2-1 (continued)
Bedrock Elevations
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Sample Points	Ground Surface Elevation (feet)	Depth to Bedrock (feet)	Bedrock Elevation (feet)
B901S	1124.8	66.0	1058.8
B902S	1124.5	66.0	1058.5
B916S	1124.5	66.0	1058.5
B918S	1123.9	66.0	1057.9
B925S	1123.8	65.0	1058.8
B934S	1123.3	64.0	1059.3
B943S	1122.6	64.5	1058.1
B1404	1119.2	57.0	1062.2
B1405	1119.5	65.0	1054.5
B1406	1113.1	53.9	1059.2
B1407	1109.5	56.0	1053.5
B1408	1103.2	48.3	1054.9
B1409	1102.1	50.0	1052.1
B1410	1095.7	41.0	1054.7
B1411	1078.8	25.0	1053.8
B1412	1077.2	23.5	1053.7
B1413	1076.4	20.5	1055.9
B1414	1076.5	20.5	1056.0
B1415	1136.3	54.8	1081.5
B1416	1125.9	63.6	1062.3
B1417	1130.8	65.0	1065.8
B2144S	1117.6	61.5	1056.1
B2183S	1116.4	59.5	1056.9
B2203S	1115.7	58.5	1057.2
B2322S	1115.3	58.0	1057.3
B2325S	1113.3	56.8	1056.5
B2333S	1115.9	59.0	1056.9
B2335S	1115.2	58.0	1057.2
B2336S	1114.6	57.8	1056.8
B2337S	1114.0	56.5	1057.5
B2344S	1116.1	59.0	1057.1
B2345S	1115.7	58.5	1057.2
B2347S	1114.9	58.0	1056.9
B2350S	1112.8	56.0	1056.8
B2358S	1115.5	58.0	1057.5
B2360S	1114.6	57.8	1056.8
B2369S	1115.6	59.0	1056.6
B2370S	1115.3	58.3	1057.0
B2429S	1109.9	56.0	1053.9
A1	1064.7	24.8	1039.9
A2	1063.4	41.9	1021.5
A3	1060.6	40.2	1020.4
A4	1059.2	40.5	1018.7
A5	1058.1	42.7	1015.4
A6	1060.4	45.9	1014.5
A7	1061.7	53.2	1008.5
A8	1059.0	50.6	1008.4
A9	1057.8	46.8	1011.0

Sample Points	Ground Surface Elevation (feet)	Depth to Bedrock (feet)	Bedrock Elevation (feet)
A10	1063.1	52.6	1010.5
A11	1053.7	44.4	1009.3
A12	1051.1	41.2	1009.9
A13	1049.0	40.1	1008.9
B1	1061.0	21.7	1039.3
B2	1061.7	32.1	1029.6
B3	1061.2	38.2	1023.0
B4	1061.1	44.8	1016.3
B5	1055.6	39.2	1016.4
B6	1056.8	38.5	1018.3
B7	1056.3	42.0	1014.3
B8	1055.4	44.0	1011.4
B9	1055.6	46.0	1009.6
B10	1056.1	46.0	1010.1
B11	1049.6	42.0	1007.6
B12	1052.7	43.0	1009.7
B13	1050.3	40.0	1010.3
C1	1058.2	18.4	1039.8
C2	1057.9	24.9	1033.0
C3	1058.6	33.2	1025.4
C4	1059.8	38.9	1020.9
C5	1060.5	44.0	1016.5
C6	1062.0	46.0	1016.0
C7	1051.5	38.0	1013.5
C8	1048.5	35.2	1013.3
D1	1062.2	21.9	1040.3
D2	1061.6	35.2	1026.4
D3	1063.7	43.9	1019.8
D4	1056.4	40.4	1016.0
D5	1056.2	39.7	1016.5
D6	1056.9	41.0	1015.9
D7	1056.8	45.0	1011.8
D8	1055.6	43.0	1012.6
D9	1065.6	54.0	1011.6
D10	1063.7	52.0	1011.7
D11	1059.0	50.0	1009.0
D12	1048.8	39.0	1009.8
D13	1052.3	42.0	1010.3
E1	1063.0	24.0	1039.0
E2	1061.2	35.0	1026.2
E3	1060.2	42.0	1018.2
E4	1061.3	43.5	1017.8
E5	1060.5	40.0	1020.5
E6	1057.4	44.0	1013.4
E7	1054.6	40.0	1014.6
E8	1054.9	45.0	1009.9
E9	1052.8	42.0	1010.8
E10	1055.2	44.0	1011.2

Table 2-1 (continued)
Bedrock Elevations
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Fort Riley, Kansas

Sample Points	Ground Surface Elevation (feet)	Depth to Bedrock (feet)	Bedrock Elevation (feet)
F1	1056.6	40.5	1016.1
F2	1060.2	43.5	1016.7
F3	1057.5	44.5	1013.0
F4	1060.5	39.0	1021.5
F5	1060.8	40.0	1020.8
F6	1061.8	42.0	1019.8
F7	1063.7	50.0	1013.7
G1	1060.0	43.0	1017.0
G2	1061.6	44.0	1017.6
G3	1062.0	42.8	1019.2
G4	1062.4	44.4	1018.0
G5	1063.1	55.0	1008.1
HC1	1057.2	40.9	1016.3
HC2	1058.9	41.1	1017.8
HC3	1059.8	42.7	1017.1
HC4	1062.4	44.9	1017.5
HC5	1063.2	51.3	1011.9
HC6	1064.4	55.7	1008.7
HC7	1060.7	50.7	1010.0
HC8	1059.7	53.2	1006.5
HC9	1056.6	50.6	1006.0
B354-99-07	1099.5	43.0	1056.5
B354-99-08	1114.3	57.5	1056.8
B354-99-09	1088.7	32.2	1056.5
B354-00-10	1120.9	62.3	1058.6
B354-01-24	1077.0	21.5	1055.5
B354-01-25	1067.4	10.8	1056.6
B354-01-26	1128.3	69.6	1058.7
B354-01-27	1113.6	56.3	1057.3
B354-01-28	1124.1	63.6	1060.5
B354-01-29c	1065.1	44.0	1021.1
B354-01-30c	1049.3	42.0	1007.3
P1	1089.4	33.0	1056.4
P2	1086.7	30.0	1056.7
P3	1089.7	34.0	1055.7
P4	1065.7	10.0	1055.7
P5	1073.0	16.8	1056.2

Sample Points	Ground Surface Elevation (feet)	Depth to Bedrock (feet)	Bedrock Elevation (feet)
P6	1069.9	13.5	1056.4
T1	1100.0	43.6	1056.4
T2	1099.0	42.5	1056.5
T3	1094.2	35.0	1059.2
T4	1093.2	36.0	1057.2
T5	1087.4	31.0	1056.4
T7	1063.1	24.0	1039.1
T8	1062.7	23.0	1039.7
T9	1075.7	19.5	1056.2
T10	1072.6	16.3	1056.3
T11	1091.9	36.0	1055.9
T12	1089.6	31.5	1058.1
T14	1086.5	28.0	1058.5
T15	1074.9	19.0	1055.9
T21	1072.4	16.0	1056.4
MPL94-01	1061.1	NA	NA
MPL94-02	1060.2	NA	NA
MPL94-03	1060.0	NA	NA
PSF92-02	1077.8	NA	NA
PSF92-03	1077.5	NA	NA
PSF92-04	1078.6	NA	NA
PSF92-05	1062.3	NA	NA
TSO292-01	1083.1	26.0	1057.1
TSO292-02	1065.3	9.2	1056.1
MW95-03	1065.2	NA	NA
MW95-04	1082.5	NA	NA
MW95-06	1090.0	33.7	1056.3
PZ-A	1067.8	NA	NA
PZ-B	1065.6	NA	NA
PZ-C	1063.6	NA	NA
PZ-D	1062.0	NA	NA
B388MW94-2	1104.5	41.9	1062.6
B388MW94-3	1102.0	39.0	1063.0
B388MW94-5	1094.3	33.0	1061.3
B388MW95-6	1077.0	17.4	1059.6
B263SB-5	1125.7	20.7	1105.5

Notes:
NA = Not Available
All elevations recorded in feet above mean sea level

Table 2-2
Well and Piezometer Construction Data
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Fort Riley, Kansas

Well Number	Surface Elevation (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Screened Interval (ft bgs)	Length of Screen (ft)	Top of Screen Elevation (ft)	Well Coordinates	
							Northing	Easting
TS0292-01	1083.5	1084.00	29.9	19.8-29.8	10.0	1063.7	267711.01	1659529.71
TS0292-02	1065.7	1066.02	17.4	7.0-17.0	10.0	1058.7	267587.39	1659600.05
MW95-03	NM	1064.97	35.5	19.5-34.5	15.0	NA	267251.36	1659694.05
MW95-04	NM	1062.16	33.6	18.5-33.5	15.0	NA	267538.18	1659877.95
MW95-06	1090.3	1090.31	34.6	18.5-33.6	15.1	1071.8	267835.48	1659498.81
B354-99-07	1099.5	1101.92	45.8	27.9-42.8	14.9	1071.6	268300.75	1659339.15
B354-99-08	1114.3	1117.12	58.1	42.1-57.1	15.0	1072.2	269055.86	1659493.29
B354-99-09	1088.7	1091.12	34.6	22.1-33.1	11.0	1066.6	267920.42	1659316.70
B354-00-10	1120.9	1123.66	81.1	68.1-78.0	9.9	1052.8	269203.64	1659250.18
B354-99-11	1057.0	1059.13	27.8	10.0-25.0	15.0	1047.0	266881.02	1658844.52
B354-99-11C	1056.8	1058.80	43.0	35.0-40.0	5.0	1021.8	266891.40	1658841.48
B354-99-12	1058.9	1060.98	27.1	9.1-24.1	15.0	1049.8	266595.54	1659825.68
B354-99-12B	1058.8	1060.96	38.8	25.8-35.8	10.0	1033.0	266590.25	1659830.58
B354-99-12C	1059.2	1061.29	44.3	36.3-41.3	5.0	1022.9	266585.10	1659838.98
B354-99-13B	1060.1	1062.09	42.0	29.0-39.0	10.0	1031.1	265814.58	1660221.49
B354-99-13C	1059.7	1061.79	51.0	43.0-48.0	5.0	1016.7	265822.05	1660215.51
B354-00-PZ14	1054.5	1057.76	23.2	7.6-23.0	15.4	1046.9	265303.16	1659469.98
B354-00-PZ14C	1054.8	1057.71	45.6	35.1-45.3	10.2	1019.7	265298.94	1659464.81
B354-00-PZ15	1061.1	1064.07	29.4	13.8-29.2	15.4	1047.3	268303.71	1661591.48
B354-00-PZ16	1049.2	1051.96	22.6	7.0-22.4	15.4	1042.2	268038.45	1662102.83
B354-00-PZ17	1062.8	1065.73	30.6	14.9-30.4	15.5	1047.9	265964.32	1659085.13
B354-00-PZ18	1073.6	1076.04	20.8	10.3-20.6	10.3	1063.3	267486.92	1659153.86
B354-00-PZ19	1058.0	1060.58	26.0	10.4-25.8	15.4	1047.6	267107.62	1660940.36
B354-01-PZ19C	1057.9	1060.60	39.5	28.8-39.1	10.3	1029.1	267117.98	1660943.58
B354-00-PZ20	1051.1	1053.95	22.6	7.0-22.4	15.4	1044.1	266108.17	1661579.01
B354-01-PZ20C	1051.2	1054.10	39.7	29.2-39.4	10.2	1022.0	266117.51	1661577.88
B354-00-PZ21	1056.7	1059.36	24.9	9.2-24.7	15.5	1047.5	265771.44	1658220.15

Table 2-2 (continued)
Well and Piezometer Construction Data
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Fort Riley, Kansas

Well Number	Surface Elevation (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Screened Interval (ft bgs)	Length of Screen (ft)	Top of Screen Elevation (ft)	Well Coordinates	
							Northing	Easting
B354-00-PZ22	1057.2	1060.40	25.4	9.7-25.2	15.5	1047.5	266670.56	1658262.65
B354-00-PZ23	1064.1	1067.24	32.5	16.8-32.3	15.5	1047.3	266663.67	1657260.34
B354-01-24	1077.0	1079.83	34.5	24.2-33.9	9.7	1052.8	267937.52	1659140.08
B354-01-25	1067.4	1069.83	26.0	11.8-21.6	9.8	1055.6	267495.63	1659309.58
B354-01-26	1128.3	1130.79	70.8	60.4-70.2	9.8	1067.9	270289.58	1659165.19
B354-01-27	1113.6	1116.38	57.3	47.0-56.7	9.7	1066.6	268855.01	1659441.78
B354-01-28	1124.1	1126.68	65.3	55.0-64.7	9.7	1069.1	270639.43	1659096.50
B354-01-29C	1065.1	1067.84	44.6	33.5-43.2	9.7	1032.0	267242.64	1659697.17
B354-01-30C	1049.3	1051.76	43.3	33.0-42.8	9.8	1016.3	265348.04	1660735.40
B354-01-31	1051.6	1054.09	20.2	4.5-19.9	15.4	1047.1	267401.80	1662043.74
B354-01-31C	1051.5	1054.56	40.4	29.9-40.1	10.2	1021.6	267401.10	1662047.98
MPL94-01	1061.1	1063.02	NM	NA	NA	NA	266181.36	1659951.17
MPL94-02	1060.2	1062.62	NM	NA	NA	NA	266438.31	1659282.58
MPL94-03	1060.0	1062.34	NM	NA	NA	NA	265804.60	1660216.48
PZ-A	1068.8	1068.71	11.9	NA	NA	NA	267582.27	1659486.18
PZ-B	1066.3	1066.44	8.6	NA	NA	NA	267679.83	1659714.79
PZ-C	NM	1063.74	30.0	NA	NA	NA	267285.04	1659360.51
PZ-D	NM	1062.06	29.9	NA	NA	NA	267438.26	1659894.04
PSF92-01	1089.0	1090.78	NM	NA	NA	NA	268876.76	1660075.46
PSF92-02	1078.5	1080.42	28.0	NA	NA	NA	268520.45	1660325.13
PSF92-03	1077.9	1080.80	28.0	NA	NA	NA	268446.35	1660347.34
PSF92-04	1079.1	1080.58	29.5	NA	NA	NA	268334.22	1660346.18
PSF92-05	1062.3	1063.77	28.0	NA	NA	NA	268252.64	1660473.48

Notes:

Elevations are presented in feet above mean sea level
bgs - below ground surface
ft - feet
NA - not available
NM - not measured
TOC - Top of casing

The above coordinates are provided in Kansas State Plane north zone. Units are in feet.
The projection is polyconic, based on the 1983 North American Datum (NAD83).

Table 2-3
Soil Geotechnical and TOC Data
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Well ID	Sample Number	Sample Depth (ft bgs)	USCS Classification	TOC mg/kg	Specific Gravity	Bulk Density g/cm³	Porosity %	Permeability ft/day (cm/sec)
B354-99-07	*SS-1*	*0 - 0.5*		*9,200*				
	CS-1	*7.5 - 8.0*		*550*				
	ST-1	15 - 17	CL		2.71	1.69	36.4	
	CS-5	*25.0 - 25.5*		*ND (100)*				
	CS-7	*36.0 - 36.5*		*ND (100)*				
B354-99-08	ST-1	5 - 7	CL		2.68	1.65	37.6	
	CS-1	*7 - 7.5*		*4,600*				
	CS-5	*27.5 - 28*		*330*				
	ST-2	30 - 32	CL		2.69	1.65	37.9	0.001 (3.40E-07)
	CS-10	*50 - 50.5*		*ND (100)*				
B354-99-09	*SS-1*	*0 - 0.5*		*7,400*				
	CS-1	*6 - 6.5*		*3,700*				
	CS-4	*24 - 24.5*		*ND (100)*				
	ST-1	30 - 32	SP		2.63	1.73	34.9	
	CS-6	*31.5 - 32*		*2,000*				
B354-01-26	*SB-01*	*0.5 - 1*		*15,000*				
	S-1	5 - 7	SP - SM		2.66	1.57	40.9	1.200 (4.10E-01)
	SB-02	*7.5 - 8*		*530*				
	S-2	24.5 - 27	CL		2.71	1.62	38.8	0.0054 (1.90E-06)
	SB-03	*27 - 27.5*		*580*				
	S-3	59.5 - 62	CH		2.73	1.55	41.4	
	SB-04	*63 - 63.5*		*180*				
B354-01-27	*SB-01*	*0 - 1*		*13,900*				
	S-1	5 - 7	CL		2.66	1.73	34.9	0.18 (6.40E-05)
	SB-02	*8 - 9*		*869*				
	S-2	34.5 - 36.5	ML		2.66	1.73	34.7	0.62 (2.20E-04)
	SB-03	*39 - 39.5*		*109*				
	SB-04	*49 - 49.5*		*ND (100)*				

Table 2-3 (continued)
Soil Geotechnical and TOC Data
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Well ID	Sample Number	Sample Depth (ft bgs)	USCS Classification	TOC mg/kg	Specific Gravity	Bulk Density	Porosity %	Permeability ft/day (cm/sec)
B354-01-28	*SB-01*	*10.5 - 11*		*14,100*				
	S-1	5 - 7	SM		2.66	1.40	47.2	1.81 (5.20E-04)
	SB-02	*8 - 8.5*		*12,000*				
	S-2	30 - 32	CL - ML		2.68	1.59	40.0	0.27 (9.40E-05)
	SB-03	*30 - 30.5*		*213*				
	S-3	50 - 52	CL		2.71	1.61	39.6	
	SB-04	*56 - 56.5*		*6,520*				
B354-01-29c	S-1	25.5 - 27.3	SP - SM		2.66	1.66	37.4	
	SB-01	*37.5 - 39.5*		*3,600*				
B354-01-30c	*SB-01*	*29.5 - 31.75*		*10,600*				

Notes:
1. Geotechnical samples and TOC samples were taken at different depth intervals at each well boring. TOC samples are shown in italics.
2. Bulk density calculated assuming particle density of 2.65 g/cm^3.

bgs - below ground surface
cm/sec - centimeters per second
ft - feet
ft/day - feet per day
g/cm^3 - grams per cubic centimeter
mg/kg - milligrams per kilogram
ND - non detect (with reporting limit)
TOC - Total Organic Carbon

ASTM Methods
USCS Classification of Soils (ASTM D2487)
Specific Gravity (ASTM D854)
Permeability (ASTM D5084 or D2434)

USCS - Unified Soil Classification System
SP - Poorly Graded Sand (narrow range of grain sizes)
SM - Silty Sand
ML - Silt (non-expanding silt)
CL - Lean Clay (non-expanding clay)
CH - Clay (High Plasticity)

Table 2-4
Groundwater Elevations through July 2002
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Well ID	Top of Casing Elevation	Total Depth	Depth to Water 10/23/2000	Water Level Elevations 10/23/2000	Depth to Water 3/26/2001	Water Level Elevations 3/26/2001	Depth to Water 7/12/2001	Water Level Elevations 7/12/2001	Depth to Water 8/30/2001	Water Level Elevations 8/30/2001	Depth to Water 9/24/2001	Water Level Elevations 9/24/2001	Depth to Water 10/24/2001	Water Level Elevations 10/24/2001	Depth to Water 11/26/2001	Water Level Elevations 11/26/2001
TS0292-01	1084.00	29.9	24.90	1059.10	24.60	1059.40	24.67	1059.33	24.76	1059.24	24.76	1059.24	24.79	1059.21	24.87	1059.13
TS0292-02	1066.02	17.4	15.05	1050.97	13.75	1052.27	14.18	1051.84	14.63	1051.39	14.45	1051.57	15.14	1050.88	15.35	1050.67
MW95-03	1064.97	35.5	27.29	1037.68	24.61	1040.36	23.21	1041.76	25.94	1039.03	25.51	1039.46	25.96	1039.01	26.69	1038.28
MW95-04	1062.19	33.6	24.27	1037.92	21.79	1040.40	20.29	1041.90	22.99	1039.20	22.57	1039.62	22.98	1039.21	23.72	1038.47
MW95-06	1090.31	34.6	30.89	1059.42	30.83	1059.48	30.92	1059.39	30.99	1059.32	30.97	1059.34	30.96	1059.35	31.05	1059.26
B354-99-07	1101.92	45.8	40.33	1061.59	40.68	1061.24	40.52	1061.40	40.92	1061.00	41.71	1060.21	40.64	1061.28	40.77	1061.15
B354-99-08	1117.12	58.1	51.19	1065.93	51.58	1065.54	51.18	1065.94	51.41	1065.71	51.65	1065.47	51.56	1065.56	51.85	1065.27
B354-99-09	1091.12	34.6	31.76	1059.36	31.82	1059.30	32.09	1059.03	32.01	1059.11	31.97	1059.15	31.90	1059.22	31.99	1059.13
B354-00-10	1123.66	81.1	56.03	1067.63	56.52	1067.14	56.00	1067.66	56.44	1067.22	56.58	1067.08	56.41	1067.25	57.83	1065.83
B354-99-11	1059.13	27.8	21.42	1037.71	18.05	1041.08	17.54	1041.59	19.52	1039.61	19.05	1040.08	20.20	1038.93	20.74	1038.39
B354-99-11c	1058.80	43.0	21.16	1037.64	17.73	1041.07	17.22	1041.58	19.22	1039.58	18.74	1040.06	19.88	1038.92	20.41	1038.39
B354-99-12	1060.98	27.1	23.55	1037.43	20.42	1040.56	19.99	1040.99	21.77	1039.21	21.36	1039.62	22.50	1038.48	23.01	1037.97
B354-99-12b	1060.96	38.8	23.60	1037.36	20.36	1040.60	20.05	1040.91	21.65	1039.31	21.27	1039.69	22.51	1038.45	23.01	1037.95
B354-99-12c	1061.29	44.3	23.95	1037.34	20.68	1040.61	20.55	1040.74	21.88	1039.41	21.51	1039.78	22.88	1038.41	23.35	1037.94
B354-99-13b	1062.09	42.0	24.87	1037.22	21.56	1040.53	22.18	1039.91	22.23	1039.86	22.17	1039.92	23.94	1038.15	24.35	1037.74
B354-99-13c	1061.79	51.0	24.57	1037.22	21.25	1040.54	21.95	1039.84	21.93	1039.88	21.67	1039.92	23.64	1038.15	24.03	1037.76
B354-00-PZ14	1057.76	23.2 (bgs)	20.42	1037.34	17.30	1040.46	18.02	1039.74	17.30	1040.46	17.49	1040.27	19.45	1038.31	19.80	1037.98
B354-00-PZ14c	1057.71	45.6 (bgs)	20.36	1037.35	16.99	1040.72	18.18	1039.53	17.25	1040.46	17.45	1040.26	19.40	1038.31	19.74	1037.97
B354-00-PZ15	1064.07	29.4 (bgs)	26.92	1037.15	22.81	1041.26	24.54	1039.53	24.99	1039.08	24.91	1039.16	26.15	1037.92	26.54	1037.53
B354-00-PZ16	1051.96	22.6 (bgs)	15.17	1036.79	12.60	1039.36	13.59	1038.37	12.76	1039.20	13.01	1038.95	15.17	1036.79	14.76	1037.20
B354-00-PZ17	1065.17	30.6 (bgs)	28.24	1036.93	24.79	1040.38	25.17	1040.00	25.53	1039.64	25.38	1039.79	28.19	1036.98	27.58	1037.59
B354-00-PZ18	1076.04	20.8 (bgs)	20.45	1055.59	20.45	1055.59	20.46	1055.58	20.60	1055.44	20.57	1055.47	20.47	1055.57	20.49	1055.55
B354-00-PZ19	1060.58	26.0 (bgs)	22.96	1037.62	21.08	1039.50	20.10	1040.48	20.95	1039.63	20.73	1039.85	22.08	1038.50	22.50	1038.08
B354-01-19c	1060.60	42.4	MONITORING WELL INSTALLED												22.51	1038.09
B354-00-PZ20	1053.95	22.6 (bgs)	17.00	1036.95	14.12	1039.83	15.42	1038.53	14.25	1039.70	14.54	1039.41	16.27	1037.68	16.58	1037.37
B354-01-20c	1054.10	43.0	MONITORING WELL NOT INSTALLED								14.70	1039.40	16.43	1037.67	16.72	1037.38
B354-00-PZ21	1059.36	24.9 (bgs)	21.82	1037.54	18.16	1041.20	19.54	1039.82	18.32	1041.04	18.65	1040.71	20.64	1038.72	20.95	1038.41
B354-00-PZ22	1060.40	25.4 (bgs)	22.68	1037.72	18.91	1041.49	19.10	1041.30	19.90	1040.50	19.62	1040.78	21.42	1038.96	21.91	1038.49
B354-00-PZ23	1067.24	32.5 (bgs)	29.37	1037.87	25.45	1041.79	27.08	1040.16	25.65	1041.59	26.01	1041.23	28.19	1039.05	28.56	1038.68
B354-01-24	1079.83	37.5									21.91	1057.92	21.84	1057.99	24.04	1055.79
B354-01-25	1069.83	25.0									18.08	1051.75	17.80	1052.03	18.18	1051.65
B354-01-26	1130.79	74.0									57.28	1073.51	57.32	1073.47	59.30	1071.49
B354-01-27	1116.38	60.2									52.01	1064.37	51.93	1064.45	52.41	1063.97
B354-01-28	1126.68	68.7	MONITORING WELLS NOT INSTALLED								50.21	1076.47	50.29	1076.39	52.03	1074.65
B354-01-29c	1067.84	46.7									28.36	1039.48	26.80	1039.04	29.52	1038.32
B354-01-30c	1051.76	46.3									11.96	1039.80	13.90	1037.86	14.20	1037.56
B354-01-31	1054.09	23.3									15.02	1039.07	16.57	1037.52	16.83	1037.26
B354-01-31c	1054.56	43.9									15.48	1039.08	17.04	1037.52	17.29	1037.27
MPL94-01	1063.02	NM	25.68	1037.34	22.37	1040.65	22.51	1040.51	23.42	1039.60	23.14	1039.88	24.68	1038.34	25.14	1037.88
MPL94-02	1062.62	NM	25.20	1037.42	21.82	1040.60	21.67	1040.95	23.05	1039.57	22.67	1039.95	24.09	1038.53	24.59	1036.03
MPL94-03	1062.34	NM	NM	NM	21.77	1040.57	22.39	1039.95	22.54	1039.80	22.41	1039.93	24.19	1038.15	24.60	1037.74
PZ-A	1068.71	11.9	10.96	1057.75	10.60	1058.11	10.65	1058.06	10.97	1057.74	10.93	1057.78	10.84	1057.87	11.02	1057.69
PZ-B	1066.44	8.6	Dry	Dry	Dry	Dry	8.32	1058.12	8.46	1057.98	Dry	Dry	Dry	Dry	Dry	Dry
PZ-C	1063.74	30.0	26.76	1036.98	23.78	1039.96	22.27	1041.47	25.32	1038.42	24.62	1039.12R	25.19	1038.55	26.10	1037.64
PZ-D	1062.06	29.9	24.30	1037.76	21.75	1040.31	20.28	1041.78	22.99	1039.07	22.58	1039.48	23.00	1039.06	23.73	1038.33
PSF92-01	1090.78	NM	26.08	1064.72	28.15	1064.63	25.67	1065.11	26.28	1064.50	26.34	1084.44	26.36	1064.42	26.85	1063.93
PSF92-02	1080.42	28.0	24.45	1055.97	22.88	1057.54	23.56	1058.88	23.88	1058.56	24.02	1058.40	24.31	1058.11	24.57	1055.85
PSF92-03	1080.80	28.0	24.62	1056.18	23.61	1057.19	24.06	1056.74	24.11	1056.69	24.09	1056.71	24.61	1056.19	24.27	1056.53

Table 2-4 (continued)
Groundwater Elevations through July 2002
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Fort Riley, Kansas

Well ID	Top of Casing Elevation	Total Depth	Depth to Water 10/23/2000	Water Level Elevations 10/23/2000	Depth to Water 3/26/2001	Water Level Elevations 3/26/2001	Depth to Water 7/12/2001	Water Level Elevations 7/12/2001	Depth to Water 8/30/2001	Water Level Elevations 8/30/2001	Depth to Water 9/24/2001	Water Level Elevations 9/24/2001	Depth to Water 10/24/2001	Water Level Elevations 10/24/2001	Depth to Water 11/26/2001	Water Level Elevations 11/26/2001
PSF92-04	1080.58	29.5	24.87	1055.71	24.45	1056.13	24.40	1056.18	24.10	1056.48	24.28	1056.30	24.72	1055.86	25.03	1055.55
PSF92-05	1063.77	28.0	22.24	1041.53	21.35	1042.42	20.32	1043.45	21.50	1042.27	21.41	1042.36	21.76	1042.01	22.25	1041.52
DCF99-37b	1065.35	33.1 (bgs)	27.63	1037.72	23.69	1041.66	24.52	1040.83	24.32	1041.03	24.27	1041.08	26.01	1039.34	26.80	1038.55
DCF99-37c	1064.98	48.1 (bgs)	27.28	1037.70	23.34	1041.62	24.30	1040.66	23.90	1041.06	23.91	1041.05	26.38	1038.58	26.41	1038.55
DCF99-38b	1064.18	30.6 (bgs)	26.36	1037.82	22.79	1041.39	23.71	1040.47	23.26	1040.92	23.12	1041.06	25.11	1039.07	25.72	1038.46
DCF99-38c	1063.97	45.6 (bgs)	26.60	1037.37	22.55	1041.42	23.65	1040.32	22.99	1040.98	23.37	1040.60	25.34	1038.63	25.49	1038.48
Kansas River Stage	NA	NM	NA	1037.47	NA	1040.77	NA	1039.33	NA	1040.59	NA	1040.21	NA	1038.25	NA	1037.97

Notes:
1. All results shown in feet above mean sea level unless otherwise indicated.
2. Kansas River Stage at Henry Drive Bridge, Fort Riley.
NM - Not Measured
NA - Not Available
R - Water level rejected for purposes of contouring.
bgs - below ground surface

Table 2-4 (continued)
Groundwater Elevations through July 2002
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Fort Riley, Kansas

Well ID	Depth to Water 12/18/2001	Water Level Elevations 12/18/2001	Depth to Water 1/14/2002	Water Level Elevations 1/14/2002	Depth to Water 2/19/2002	Water Level Elevations 2/19/2002	Depth to Water 3/14/2002	Water Level Elevations 3/14/2002	Depth to Water 4/22/2002	Water Level Elevations 4/22/2002	Depth to Water 5/21/2002	Water Level Elevations 5/21/2002	Depth to Water 6/24/2002	Water Level Elevations 6/24/2002	Depth to Water 7/8/2002	Water Level Elevations 7/8/2002
TS0292-01	24.87	1059.13	25.02	1058.98	24.93	1059.07	24.96	1059.04	25.01	1058.99	24.75	1059.25	24.99	1059.01	25.13	1058.87
TS0292-02	15.14	1050.88	15.15	1050.87	15.21	1050.81	15.25	1050.77	14.98	1051.04	13.85	1052.17	14.72	1051.30	14.88	1051.14
MW95-03	26.63	1038.34	26.22	1038.75	26.46	1038.51	26.55	1038.42	26.91	1038.06	26.67	1038.30	26.79	1038.18	26.83	1038.14
MW95-04	23.81	1038.38	23.37	1038.82	23.43	1038.76	23.66	1038.53	24.02	1038.17	23.68	1038.51	23.84	1038.35	23.91	1038.28
MW95-06	31.03	1059.28	31.06	1059.25	31.24	1059.07	31.13	1059.18	31.31	1059.00	31.15	1059.16	31.36	1058.95	31.41	1058.90
B354-99-07	40.76	1061.16	40.86	1061.06	40.94	1060.98	40.96	1060.96	41.19	1060.73	41.14	1060.78	41.17	1060.75	41.18	1060.74
B354-99-08	51.86	1065.26	52.19	1064.93	52.18	1064.94	52.18	1064.94	52.75	1064.37	52.51	1064.61	52.53	1064.59	52.65	1064.47
B354-99-09	31.93	1059.19	31.97	1059.15	32.02	1059.10	32.05	1059.07	32.24	1058.88	32.19	1058.93	32.26	1058.86	32.3	1058.82
B354-00-10	56.87	1066.79	57.25	1066.41	57.26	1066.40	57.33	1066.33	57.98	1065.68	57.52	1066.14	57.59	1066.07	57.80	1065.86
B354-99-11	20.68	1038.45	20.27	1038.86	20.32	1038.81	20.61	1038.52	20.90	1038.23	20.73	1038.40	20.83	1038.30	20.71	1038.42
B354-99-11c	20.35	1038.45	19.95	1038.85	20.00	1038.80	20.28	1038.52	20.59	1038.21	20.40	1038.40	20.54	1038.26	20.36	1038.44
B354-99-12	22.94	1038.04	25.57	1035.41R	22.61	1038.37	22.85	1038.13	23.16	1037.82	23.02	1037.96	23.12	1037.86	22.88	1038.10
B354-99-12b	22.90	1038.06	22.50	1038.46	22.58	1038.38	22.85	1038.11	23.12	1037.84	23.02	1037.94	23.12	1037.84	22.81	1038.15
B354-99-12c	23.22	1038.07	22.88	1038.41	22.93	1038.36	23.20	1038.09	23.49	1037.80	23.39	1037.90	23.47	1037.82	23.08	1038.21
B354-99-13b	23.99	1038.10	23.84	1038.25	23.91	1038.18	24.16	1037.93	23.31	1038.78R	24.34	1037.75	24.48	1037.61	22.59	1039.50R
B354-99-13c	23.62	1038.17	23.51	1038.28	23.60	1038.19	23.87	1037.92	23.96	1037.83	24.08	1037.71	24.17	1037.62	23.22	1038.57
B354-00-PZ14	18.85	1038.91	19.27	1038.49	19.37	1038.39	19.70	1038.06	19.54	1038.22	19.84	1037.92	19.96	1037.80	18.48	1039.28
B354-00-PZ14c	18.72	1038.99	19.22	1038.49	19.32	1038.39	19.66	1038.05	19.46	1038.25	19.78	1037.93	19.91	1037.80	18.43	1039.28
B354-00-PZ15	25.29	1038.78	26.23	1037.84	26.31	1037.76	26.51	1037.56	26.66	1037.41	26.68	1037.39	26.76	1037.31	26.17	1037.90
B354-00-PZ16	13.67	1038.29	14.44	1037.52	14.51	1037.45	14.81	1037.15	14.52	1037.44	14.91	1037.05	15.03	1036.93	13.81	1038.15
B354-00-PZ17	27.37	1037.80	27.07	1038.10	27.15	1038.02	27.42	1037.75	27.58	1037.59	27.59	1037.58	27.71	1037.46	26.93	1038.24
B354-00-PZ18	20.45	1055.59	20.45	1055.59	20.46	1055.58	20.45	1055.59	20.51	1055.53	20.49	1055.55	20.59	1055.45	20.69	1055.35
B354-00-PZ19	22.33	1038.25	21.52	1039.06R	22.17	1038.41	22.38	1038.20	22.58	1038.00	22.57	1038.01	22.66	1037.92	22.15	1038.43
B354-01-19c	22.33	1038.27	22.09	1038.51	22.17	1038.43	22.38	1038.22	22.59	1038.01	22.58	1038.02	22.66	1037.94	22.16	1038.44
B354-00-PZ20	15.35	1038.60	16.11	1037.84	16.21	1037.74	16.55	1037.40	16.24	1037.71	16.66	1037.29	16.78	1037.17	15.34	1038.61
B354-01-20c	15.50	1038.60	16.27	1037.83	16.38	1037.72	16.69	1037.41	16.40	1037.70	16.79	1037.31	16.93	1037.17	15.48	1038.62
B354-00-PZ21	19.51	1039.85	20.52	1038.84	20.60	1038.76	20.98	1017.86	20.36	1039.00	20.32	1039.04	21.18	1038.18	19.50	1039.86
B354-00-PZ22	21.74	1038.66	21.04	1039.36	21.45	1038.95	21.75	1038.65	21.94	1038.46	21.78	1038.62	21.99	1038.41	21.47	1038.93
B354-00-PZ23	27.10	1040.14	28.00	1039.24	28.06	1039.18	28.52	1038.72	28.02	1039.22	28.48	1038.76	28.69	1038.55	26.82	1040.42
B354-01-24	21.82	1058.01	21.89	1057.94	21.91	1057.92	21.94	1057.89	21.99	1057.84	21.95	1057.88	22.11	1057.72	22.17	1057.66
B354-01-25	17.45	1052.38	17.53	1052.30	17.44	1052.39	17.45	1052.38	17.62	1052.21	17.52	1052.31	18.17	1051.66	18.34	1051.49
B354-01-26	57.72	1073.07	58.22	1072.57	58.44	1072.35	58.57	1072.22	59.30	1071.49	59.16	1071.63	59.13	1071.66	59.28	1071.51
B354-01-27	52.15	1064.23	52.47	1063.91	52.45	1063.93	52.45	1063.93	52.94	1063.44	52.81	1063.57	52.81	1063.57	52.87	1063.51
B354-01-28	50.78	1075.92	51.22	1075.48	51.46	1075.22	51.50	1075.18	52.38	1074.32	54.29	1072.39	52.22	1074.46	52.33	1074.35
B354-01-29c	29.58	1038.26	29.12	1038.72	29.17	1038.67	29.42	1038.42	29.81	1038.03	29.51	1038.33	29.65	1038.19	29.68	1038.16
B354-01-30c	12.81	1038.95	13.71	1038.05	13.81	1037.95	14.14	1037.62	13.82	1037.94	14.26	1037.50	14.38	1037.38	12.73	1039.03
B354-01-31	15.78	1038.31	16.48	1037.61	16.59	1037.50	16.86	1037.23	16.58	1037.51	16.32	1037.77	17.10	1036.99	16.18	1037.91
B354-01-31c	16.22	1038.34	16.95	1037.61	17.04	1037.52	17.32	1037.24	17.04	1037.52	16.89	1037.67	17.55	1037.01	16.64	1037.92
MPL94-01	24.96	1038.06	24.62	1038.40	24.68	1038.34	24.94	1038.08	25.19	1037.83	25.15	1037.87	25.24	1037.78	24.30	1038.72
MPL94-02	24.44	1038.18	24.07	1038.55	24.16	1038.46	24.43	1038.19	24.66	1037.96	24.58	1038.04	24.70	1037.92	24.73	1037.89
MPL94-03	24.31	1038.03	24.09	1038.25	24.16	1038.18	24.40	1037.94	24.58	1037.76	24.63	1037.71	24.70	1037.64	23.88	1038.46
PZ-A	11.03	1057.68	10.96	1057.75	10.99	1057.72	10.99	1057.72	11.19	1057.52	11.01	1057.70	10.96	1057.75	11.06	1057.65
PZ-B	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
PZ-C	26.12	1037.62	26.46	1037.28R	26.69	1037.05	26.00	1037.74	26.20	1037.54R	26.11	1037.63	26.02	1037.72	26.23	1037.51R
PZ-D	23.81	1038.25	23.37	1038.69	23.42	1038.64	23.78	1038.28	24.03	1038.03	23.78	1038.28	23.86	1038.20	23.93	1038.13
PSF92-01	26.71	1064.07	27.02	1063.76	27.10	1063.68	27.14	1063.64	27.30	1063.48	28.99	1063.79	27.02	1063.78	27.25	1063.53
PSF92-02	24.50	1055.92	24.68	1055.74	24.60	1055.82	24.70	1055.72	23.69	1056.73	23.19	1057.23	24.18	1056.24	24.55	1055.87
PSF92-03	24.81	1055.99	25.00	1055.80	24.93	1055.87	25.02	1055.78	24.11	1056.69	23.85	1056.95	24.66	1056.14	24.99	1055.81

Table 2-4 (continued)
Groundwater Elevations through July 2002
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Well ID	Depth to Water 12/18/2001	Water Level Elevations 12/18/2001	Depth to Water 1/14/2002	Water Level Elevations 1/14/2002	Depth to Water 2/19/2002	Water Level Elevations 2/19/2002	Depth to Water 3/14/2002	Water Level Elevations 3/14/2002	Depth to Water 4/22/2002	Water Level Elevations 4/22/2002	Depth to Water 5/21/2002	Water Level Elevations 5/21/2002	Depth to Water 6/24/2002	Water Level Elevations 6/24/2002	Depth to Water 7/8/2002	Water Level Elevations 7/8/2002
PSF92-04	24.93	1055.65	25.02	1055.56	25.05	1055.53	25.07	1055.51	24.52	1056.06	24.42	1056.16	24.87	1055.71	24.97	1055.61
PSF92-05	22.21	1041.56	22.15	1041.62	22.27	1041.50	22.41	1041.36	22.51	1041.26	22.06	1041.71	22.28	1041.49	22.37	1041.40
DCF99-37b	26.41	1038.94	25.93	1039.42	26.38	1038.97	26.66	1038.69	26.74	1038.61	26.61	1038.74	26.91	1038.44	25.86	1039.49
DCF99-37c	25.90	1039.08	26.31	1038.65	25.99	1038.97	26.31	1038.85	26.32	1038.64	26.28	1038.68	26.54	1038.42	25.39	1039.57
DCF99-38b	24.68	1039.30	25.24	1036.94	25.32	1038.88	25.64	1038.54	25.51	1038.67	25.48	1038.70	25.90	1038.28	24.56	1039.62
DCF99-38c	24.63	1039.34	25.02	1038.95	25.11	1038.86	25.43	1038.54	25.27	1038.70	25.23	1038.74	25.71	1038.26	24.33	1039.64
Kansas River Stage	NA	1039.80	NA	1038.53	NA	1038.41	NA	1037.98	NA	1038.54	NA	1038.54	NA	1037.76	NA	1039.64

Notes:
1. All results shown in feet above mean sea level unless otherwise indicated.
2. Kansas River Stage at Henry Drive Bridge, Fort Riley.

NM = Not Measured
NA = Not Available
bgs = below ground surface

Table 2-5
Listed and Rare Species Occurring and Potentially Occurring in the Fort Riley Area

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Fort Riley, Kansas

Common Name	Scientific Name	Federal Status	State Status
American Burying Beetle	*Nicrophorus americanus*	E	E
Baird's sparrow	*Ammodramus bairdii*	SOC	-
Bald Eagle	*Haliaeetus leucocephalus*	T-PD	T
Black Rail	*Laterallus jamaicensis*	SOC	SINC
Black Tern	*Chlidonias niger*	SOC	SINC
Blue Sucker	*Cycleptus elogatus*	SOC	SINC
Eastern Hognose Snake	*Heterodon platirhinos*	-	SINC
Eastern Spotted Skunk	*Spilogale putorius*	-	T
Eskimo Cerlew	*Numenius borealis*	E	E
False Map Turtle	*Graptemys pseudogeographica*	SOC	-
Ferruginous Hawk	*Buteo regalis*	SOC	SINC
Golden Eagle	*Aquila chrysaetos*	-	SINC
Henslow's Sparrow	*Ammodramus henslowii*	SOC	SINC
Least Tern	*Sterna antillarum*	E	E
Loggerhead Shrike	*Lanius ludovicianus*	SOC	-
Northern Goshawk	*Accipiter gentilis*	SOC	-
Paddlefish	*Polyodon spatula*	SOC	-
Peregrine Falcon	*Falco peregrinus*	E	E
Piping Plover	*Charadrius melodus*	T	T
Plains Minnow	*Hybognathus placitus*	SOC	SINC
Prairie Mole Cricket	*Gryllotalpa major*	SOC	SINC
Red-shouldered Hawk	*Buteo lineatus*	-	SINC
Regal fritillary Butterfly	*Speyeria idalia*	SOC	-
Short-eared owl	*Asio flammeus*	-	SINC
Snowy Plover	*Charadrius alexandrinus*	-	T
Southern Bog Lemming	*Synaptomys copperi*	-	SINC
Sturgeon Chub	*Macrhybopsis gelida*	C	T
Texas Horned Lizard	*Phrynosoma cornutum*	SOC	-
Timber Rattlesnake	*Crotalus horridus*	-	SINC
Topeka Shiner	*Notropis topeka*	E	T
Western Burrowing Owl	*Athene cunicularia*	SOC	-
Western Hognose Snake	*Heterodon nasicus*	-	SINC
Western Prairie Fringed Orchid	*Platanthera praeclara*	T	-
Whip-poor-will	*Caprimulgus vociferus*	-	SINC
White-faced Ibis	*Plegadis chini*	SOC	T
Whooping Crane	*Grus americana*	E	E

C = Candidate
E = Endangered
SINC = Species in Need of Conservation
SOC = Species of Concern
T = Threatened
T-PD = Threatened but Proposed for Delisting

Source: Kansas Department of Wildlife and Parks and U.S. Fish and Wildlife Service

Table 3-1
Fieldwork Chronology
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Dates	Fieldwork Performed
August 16, 1990	Three USTs removed. Tanks sold as scrap metal by Fort Riley DRMO. Petroleum contaminated soil disposed of in contractor's approved disposal location above Camp Whitside. One UST not found.
November 19 and December 5, 1991	Two USTs removed. Tanks sold as scrap metal by Fort Riley DRMO. No petroleum contaminated soil above 50 parts per million detected.
December 15, 1992	Conducted a 30-point soil-gas survey to assess the horizontal extent of petroleum contaminated soil. Soil-gas samples analyzed by on-site GC for BTEX, 1,2-DCA, and total volatile hydrocarbons.
December 16 and 21, 1992	Installed two monitoring wells, TSO292-01 and TSO292-02.
December 2, 1993 through September 28, 1994	Thirty-five depth to groundwater/free product measurements taken in TSO292-01.
September 3 and 4, 1994	Sampled TSO292-01 and TSO292-02. Benzene and PCE detected above KDHE action levels in TSO292-01.
September 9 through 15, 1994	Installed two piezometers (PZ-A and PZ-B). Sampled PZ-A and analyzed with on-site GC for BTEX.
October 17 through December 7, 1994	Advanced and sampled ten soil borings to confirm the findings of the soil-gas survey. Soil samples analyzed on-site for TPH using immunoassay.
January 10 and 11, 1995	Collected five groundwater samples using direct-push methods. Samples analyzed by on-site GC for BTEX, 1,2-DCA, total VOCs, 1,1-DCE, 1,1,1-TCA, TCE, and PCE. Attempted to collect 16 other samples, but locations were dry.
January 11, 1995	Installed two piezometers (PZ-C and PZ-D). Sampled three piezometers. Samples analyzed by on-site GC for BTEX, 1,2-DCA, total VOCs, 1,1-DCE, 1,2-DCE, 1,1,1-TCA, TCE, and PCE.
February 7 and 8, 1995	Advanced and sampled four soil borings to confirm the findings of the soil-gas survey and immunoassay results. Soil samples analyzed by off-site laboratory for VOCs and TPH. Soil contamination in 354SB-12 detected above KDHE action levels.
February 10 through March 6, 1995	Installed four monitoring wells (MW95-03, MW95-04, MW95-05, and MW95-06). One monitoring well (MW95-05) was damaged and abandoned.
March 24, 1995	Developed and sampled five existing monitoring wells (TSO292-01, TSO292-02, MW95-03, MW95-04, and MW95-06). Benzene, PCE, and lead detected above KDHE action levels in groundwater.
December 15 through 18, 1995	Performed groundwater level measurements and sampled groundwater from the three Main Post Landfill wells, the five pesticide storage facility wells, and the five Main Post solvent detection site (Building 354) wells.

Table 3-1 (continued)
Fieldwork Chronology
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Dates	Fieldwork Performed
August 19 through September 26, 1997	IFI performed at and near DPW Compound (BMcD, 1998a). Installed six temporary piezometers and 12 temporary monitoring wells. Conducted a soil-gas survey at 71 locations and analyzed on-site with GC for benzene, 1,2-DCA, PCE, and TCE. Collected subsurface soil samples for on-site analysis with GC. Collected groundwater samples from one probehole, five temporary piezometers, nine temporary monitoring wells, and four permanent piezometers for on-site analysis with GC. Collected groundwater samples from 12 existing monitoring wells near Former Building 354, the former Main Post Landfill, and the former Pesticide Storage Facility for off-site analysis (BMcD, 1998a). Took several rounds of water levels at all piezometers and monitoring wells.
November 1998	Interim groundwater sampling of selected monitoring wells and piezometers (BMcD, 1999b). Included groundwater level measurements.
July 14 through August 17, 1999 and September 2 through November 11, 1999	Direct-push soil and groundwater sampling on the terrace area (Main Post) and the Kansas River point bar.
December 15, 1999 through February 2, 2000	BMcD installed and developed four monitoring wells (B354-99-07, B354-99-08, B354-99-09, and B354-00-10).
December 20, 1999 through January 19, 2000	USACE installed and developed seven monitoring wells (B354-99-11, B354-99-11c, B354-99-12, B354-99-12b, B354-99-12c, B354-99-13b, and B354-99-13c).
February 21 through February 24, 2000	Interim groundwater sampling of selected monitoring wells and piezometers (BMcD, 2000a). Included groundwater level measurements.
March 20 and 21, 2000	Surface water sampling of the Kansas River by the USGS.
March 27 through April 25, 2000	Direct-push soil-gas and groundwater sampling on the terrace area (Main Post), the point bar (Horse Corral), and at Marshall Army Air Field.
April 12 through April 19, 2000	BMcD installed 11 piezometers (B354-00-PZ14, B354-00-PZ14c, B354-00-PZ15, B354-00-PZ16, B354-00-PZ17, B354-00-PZ18, B354-00-PZ19, B354-00-PZ20, B354-00-PZ21, B354-00-PZ22, and B354-00-PZ23).
May 30, 2000	Groundwater level measurements.
July 2000 to Present	Periodic Kansas River surface water sampling and analysis. Periodic groundwater sampling of selected monitoring wells and piezometers and analysis. Monthly groundwater elevation measurements.
Summer 2001	Shallow source delineation study using soil gas at Building 430. Additional plume delineation using groundwater screening. Shallow source delineation

Table 3-1 (continued)
Fieldwork Chronology
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Dates	Fieldwork Performed
	study using direct-push soil sampling and on-site gas chromatograph at Building 367. Installation, development, and sampling of the following 10 monitoring wells: B354-01-19c, B354-01-20c, B354-01-25, B354-01-26, B354-01-27, B354-01-28, B354-01-29c, B354-01-30c, B354-01-31, and B354-01-31c.
Fall 2001	Soil sampling for Risk Assessment
September 25 through October 11, 2001	RI groundwater sampling event
January 14 through January 23, 2002	RI groundwater sampling event
April 22 through May 2, 2002	RI groundwater sampling event
July 8 through July 17, 2002	RI groundwater sampling event
October 2002	Resample soil (for RA) at Building 367 area

Notes:
BMcD – Burns & McDonnell
BTEX - benzene, toluene, ethylbenzene, and total xylenes
DPW – Directorate of Public Works
DRMO - Defense Reutilization Marketing Office
IFI – Initial Field Investigations
GC - gas chromatograph
KDHE - Kansas Department of Health and Environment
PCE – tetrachlorethene
RA – risk assessment
RI – remedial investigation
TCE - trichloroethene
TPH - total petroleum hydrocarbons
UST – Underground storage tanks
USACE – United States Army Corps of Engineers
USGS – United States Geological Survey
VOCs - volatile organic compounds

1,1-DCE - 1,1-dichloroethene
1,2-DCE - 1,2-dichloroethene
1,1,1-TCA - 1,1,1-trichloroethane
1,2-DCA - 1,2-dichloroethane

Table 4-1
Monitoring Wells/Piezometers Sampled
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Well Number	September-97	November-98	February-00	July-00	October-00	March-01	October-01	January-02	April-02	July-02
B354-99-07	▨	▨	X	X	X	X	X	X	X	X
B354-99-08	▨	▨	X	X	X	X	X	X	X	X
B354-99-09	▨	▨	X	X	X	X	X	X	X	X
B354-00-10	▨	▨	X	X	X	X	X	X	X	X
B354-99-12	▨	▨	X	X	X	X	X	X	X	X
B354-99-12b	▨	▨	X	X	X	X	X	X	X	X
B354-99-12c	▨	▨	X	X	X	X	X	X	X	X
B354-99-13b	▨	▨	X	X	X	X	X	X	X	X
B354-99-13c	▨	▨	X	X	X	X	X	X	X	X
B354-00-PZ14c	▨	▨	▨	▨	▨	▨	X	X	X	X
B354-00-PZ19	▨	▨	▨	▨	▨	▨	X	X	X	X
B354-01-19c	▨	▨	▨	▨	▨	▨	X	X	X	X
B354-00-PZ20	▨	▨	▨	▨	▨	▨	X	X	X	X
B354-01-20c	▨	▨	▨	▨	▨	▨	X	X	X	X
B354-01-24	▨	▨	▨	▨	▨	▨	X	X	X	X
B354-01-25	▨	▨	▨	▨	▨	▨	X	X	X	X
B354-01-26	▨	▨	▨	▨	▨	▨	X	X	X	X
B354-01-27	▨	▨	▨	▨	▨	▨	X	X	X	X
B354-01-28	▨	▨	▨	▨	▨	▨	X	X	X	X
B354-01-29c	▨	▨	▨	▨	▨	▨	X	X	X	X
B354-01-30c	▨	▨	▨	▨	▨	▨	X	X	X	X
B354-01-31	▨	▨	▨	▨	▨	▨	X	X	X	X
B354-01-31c	▨	▨	▨	▨	▨	▨	X	X	X	X
PZ-A	▨	X	▨	X	X	O	X	X	X	O
PZ-B	▨	▨	▨	O	O	O	O	O	O	O
PZ-C	▨	X	X	X	X	X	X	X	X	X
PZ-D	▨	X	X	X	X	X	X	X	X	X
PSF92-01	▨	▨	X	X	X	X	X	X	X	X
PSF92-05	▨	▨	X	X	X	X	X	X	X	X
MPL94-01	X	▨	X	X	X	X	X	X	X	X
MPL94-02	X	▨	X	X	X	X	X	X	X	X
MPL94-03	▨	▨	X	X	X	X	X	X	X	X
MW95-03	▨	X	X	X	X	X	X	X	X	X
MW95-04	X	X	X	X	X	X	X	X	X	X
MW95-06	X	X	X	X	X	X	X	X	X	X
TSO292-01	X	X	X	X	X	X	X	X	X	X
TSO292-02	X	X	X	X	X	X	X	X	X	X

Notes:

X - Full or partial sample taken at monitoring well/piezometer.

O - Sample planned, but not taken (monitoring well/piezometer dry).

Shading indicates either monitoring well/piezometer not installed or not planned for sampling.

Table 4-2
Target Compound List VOCs - Groundwater
354 Area Solvent Detections RI Report
Fort Riley, Kansas

1,1,1-Trichloroethane
1,1,2,2,-Tetrachloroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethane
1,2-Dichloropropane
1,4-Dichlorobenzene
2-Butanone
2-Chloroethylvinyl ether
2-Hexanone
4-Methyl-2-pentanone
Acetone
Benzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon Disulfide
Carbon Tetrachloride (Tetrachloromethane)
Chlorobenzene
Chloroethane
Chloroform (Trichloromethane)
Chloromethane
cis-1,2-Dichloroethene
cis-1,3-Dichloropropene
Dibromochloromethane
Dichloromethane
Ethylbenzene
m,p-Xylene
o-Xylene
Styrene
Tetrachloroethene
Toluene
trans-1,2-Dichloroethene
trans-1,3-Dichloropropene
Trichloroethene
Vinyl acetate
Vinyl chloride

Table 4-3
Target Compound List SVOCs - Groundwater
354 Area Solvent Detections RI Report
Fort Riley, Kansas

1,2,4-Trichlorobenzene
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
2,4-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
2-Chloronaphthalene
2-Chlorophenol
2-Methyl naphthalene
2-Methylphenol
2-Nitroaniline
2-Nitrophenol
3,3-Dichlorobenzidine
3-Nitroaniline
4,6-Dinitro-2-methylphenol
4-Bromophenyl-phenyl ether
4-Chloro-3-methylphenol
4-Chloroaniline
4-Chlorophenyl-phenyl ether
4-Nitroaniline
4-Nitrophenol
Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(a)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
Benzoic acid
Benzyl alcohol
Bis(2-chloroethoxy)methane
Bis(2-chloroethyl)ether
Bis(2-chloroisopropyl)ether
Bis(2-ethylhexyl)phthalate
Butylbenzylphthalate
Chrysene
di-n-Butylphthalate
di-n-Octylphthalate
Dibenzo(a,h)anthracene
Dibenzofuran
Diethyl phthalate
Dimethyl phthalate
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Indeno(1,2,3-cd)pyrene
Isophorone
Methylphenol (3- & 4-)
N-Nitroso-di-n-propylamine
N-Nitrosodiphenylamine
Naphthalene
Nitrobenzene
Pentachlorophenol
Phenanthrene
Phenol
Pyrene

Table 4-4
Water Quality Parameters
Fall 2001 Sampling Event
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Point: Date Sampled: Laboratory Number:		MCL/KSWQS	B354-99-07/GW02 9/26/2001 1092415	B354-99-09/GW02 9/25/2001 1092240	B354-00-10/GW02/22 9/25/2001 1092242 / 1092243 Includes Duplicate	B354-99-12/GW02 9/26/2001 1092417	MPL94-01/GW02 9/26/2001 1092414
Water Quality Parameters	UNITS						
Iron Related Bacteria	NA	---	***Present***	***Present***	***Present / Present***	***Present***	***Present***
Chemical Oxygen Demand	mg/L	---	***20***	10 U	10 U / 10 U	***13***	***29***
Orthophosphate	mg/L	---	***0.1***	***0.1***	0.1 U / 0.1 U	0.1 U	0.1 U
Total Dissolved Solids	mg/L	500 (SMCL)	***750***	***1460***	***1230 / 1220***	***950***	***1060***
Total Suspended Solids	mg/L	---	2 U	***2***	***2 / 2***	2 U	***16***
Alkalinity	mg/L	---	***326***	***286***	***197 / 211***	***445***	***509***
Chloride	mg/L	---	***80***	***270***	***11 / 11***	***130***	***100***
Nitrate	mg/L	10	***10.8***	***27***	0.1 U / 0.1 U	0.1 U	0.1 U
Nitrate/Nitrite	mg/L	---	NA	NA	NA	NA	NA
Sulfate	mg/L	250	***120***	***130***	***640 / 650***	***140***	***200***
Calcium, Total	mg/L	---	***168***	***241***	***156 / 152***	***192***	***215***
Hardness (Calculated)	mg/L	---	***502***	***728***	***759 / 769***	***601***	***689***
Iron, Total	mg/L	---	0.1 U	0.1 U	***0.16 / 0.14***	0.1 U	***6.1***
Magnesium, Total	mg/L	---	***23***	***37.5***	***95.6 / 93.7***	***31.4***	***41.6***
Potassium, Total	mg/L	---	***4.3***	***5.9***	***3.7 / 3.7***	***18.5***	***20.8***
Silica (SiO2), Total	mg/L	---	***23.1***	***21.9***	***18.4 / 18.6***	***21.4***	***24***
Sodium, Total	mg/L	---	***35***	***58.7***	***44.4 / 43.8***	***55.7***	***54***

Notes:

NA - Not Analyzed, Not Applicable

U - Not detected above reporting limit

mg/L - milligrams per liter

MCL - Maximum Contaminant Level

SMCL - Secondary Maximium Contaminant Level

KSWQS - Kansas State Water Quality Standard

Bold, Italics - Compound was detected

See Table 5-8 for other analytical parameters from the Fall 2001 Sampling Event.

Table 5-1
RCRA Metals Detections
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location	Sample Depth (ft)	Metal Concentration (mg/kg)				
		Arsenic	Barium	Cadmium	Chromium	Lead
B113	10-12	1.2	44.0	ND	5	5.1
B117	3-4	4.7	111	0.4	11.8	**51.0**
B118	2.5-4	4	108	0.6	10.7	**35.0**
B119	3-4	2.9	124	ND	15.3	13.0
B120	3-4	1.3	76.6	ND	8.7	5.7
B121	3-4	1.4	97.7	ND	11.6	9.3
B132	6-8	1.3	102	ND	10.2	8.5
B132	19-20	ND	15.0	ND	3.0	2.8
B133	3-4	2.0	110	ND	12.1	7.6
B134	0.5-1.5	1.9	110	ND	12.4	8.6
B137	3-4	1.9	170	ND	11.6	7.5
B138	3-4	ND	64	ND	6.5	4.2
B143	3-4	2.6	140	ND	12.8	10.0
B147	4	ND	72.0	ND	5.7	4.2
B217	28-30	1.8	74.0	ND	12.0	8.8
B218A	15-17	ND	32.0	ND	4.6	4.5

Average	2.3	90.6	0.5	9.6	11.6
Median	1.9	100	0.5	11.2	8.5
Range	1.2 - 4.7	15 - 170	0.4 - 0.6	3.0 - 15.3	2.8 - 51
MAAF Background (Note 6)	5	N/A	1	24.1	32.3
USGS Regional Concentration (Note 7)	4.1	400 - 850	1.5 - 2	50	15
Average Shale Composition (Note 8)	9	250	0.18	423	80
Average Limestone Composition (Note 8)	1.8	30	0.048	7.1	16
Upper Paleozoic Shales of Kansas (Note 9)	N/A	346	29.9	140	27.7

KDHE Tier 2 Risk-Based Standards (Note 10)					
Soil Pathway Residential Scenario	11	5,500	39	390	400
Soil to Groundwater Protection Pathway Residential Scenario	29	N/A	N/A	N/A	N/A
Soil Pathway Non-Residential Scenario	38	140,000	1,000	4,000	1,000
Soil to Groundwater Protection Pathway Non-Residential Scenario	29	N/A	N/A	N/A	N/A

Table 5-1 (continued)
RCRA Metals Detections
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Notes:
1. Mercury, Selenium, and Silver were not detected in any soil sample.
2. Reporting Limits (mg/kg): Arsenic - 1; Barium - NA; Cadmium - 0.4; Chromium - NA; Lead - NA; Mercury - 0.1; Selenium - 0.6; Silver - 1.2.
3. ND - not detected
4. N/A - Not applicable or not available
5. mg/kg - milligrams per kilogram
6. From MAAF-FFTA RI/FS Workplan, Fort Riley, Kansas, BMcD (April 11, 1997)
7. From Element Concentrations in Soil and Other Surficial Materials of the Conterminous United States, USGS Prof Paper 1270 (1984)
8. From Study and Interpretation of the Chemical Characteristics of Natural Water, USGS Water Supply Paper 2254 (Hem, 1985)
9. From The Geochemistry, Mineralogy and Petrology of Upper Paleozoic Shales of Kansas, KGS Bulletin 217 (Cubitt, 1979)
10. From Risk-Based Standards for Kansas (RSK Manual - 2nd version), Kansas Department of Health and Environment (September 4, 2001)

Table 5-2

Building 367 Soil-Screening Results

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Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported PCE ug/kg*
233	15'	07/26/01	8.5J
2068	9'	08/21/01	9.1J
2068	15'	08/21/01	55
2071	9'	08/16/01	19J
2071	15'	08/16/01	21U
2072	9'	08/16/01	14J
2072	15'	08/16/01	21U
2073	9'	08/16/01	4.0J
2073	15'	08/16/01	21U
2074	9'	08/16/01	5.1J
2074	15'	08/16/01	1.9J
2075	9'	08/16/01	7.0J
2075 Dup	9'	08/16/01	8.0J
2075	15'	08/16/01	1.1J
2076	9'	08/15/01	10J
2076	15'	08/15/01	1.8J
2077	9'	08/15/01	19J
2077	15'	08/15/01	21U
2078	9'	08/13/01	20J
2078	15'	08/13/01	48J
2079	9'	08/13/01	11J
2079	15'	08/13/01	4.6J
2080	9'	08/09/01	21U
2080	15'	08/09/01	21U
2081	9'	08/09/01	7.1J
2081	15'	08/09/01	21U
2082	9'	08/10/01	21U
2082	15'	08/10/01	6.0J
2083	9'	08/10/01	1.5J
2083	15'	08/10/01	2.1J
2084	9'	08/13/01	1.7J
2084 Dup	9'	08/13/01	2.2J
2084	15'	08/13/01	4.4J
2089	9'	08/16/01	6.2J
2089 Dup	9'	08/16/01	6.8J
2089	15'	08/16/01	21U
2092	9'	08/15/01	31
2092	15'	08/15/01	21U
2093	9'	08/15/01	17J
2093	15'	08/15/01	21U
2093 Dup	15'	08/15/01	21U
2094	9'	08/15/01	26

Table 5-2 (continued)
Building 367 Soil-Screening Results
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported PCE ug/kg*
2094	15'	08/15/01	5.3J
2095	9'	08/15/01	6.9J
2095	15'	08/15/01	4.1J
2096	9'	08/15/01	1.4J
2096	15'	08/15/01	4.0J
2097	9'	08/09/01	42
2097	15'	08/09/01	2.2J
2098	9'	08/09/01	21U
2098	15'	08/09/01	21U
2099	9'	08/09/01	21U
2099	15'	08/09/01	7.4J
2100	9'	08/09/01	21U
2100	15'	08/09/01	13J
2100 Dup	15'	08/09/01	19J
2101	9'	08/10/01	9.7J
2101	15'	08/10/01	5.6J
2102	9'	08/10/01	2.4J
2102	15'	08/10/01	5.3J
2108	9'	08/22/01	3.3J
2108	15'	08/22/01	21U
2108 Dup	15'	08/22/01	21U
2109	9'	08/22/01	3.7J
2109	15'	08/22/01	21U
2110	9'	08/22/01	12J
2110	15'	08/22/01	21U
2111	9'	08/15/01	1.9J
2111	15'	08/15/01	14J
2111 Dup	15'	08/15/01	17J
2112	9'	08/15/01	6.3J
2112	15'	08/15/01	19J
2113	9'	08/15/01	21U
2113	15'	08/15/01	3.5J
2114	9'	08/09/01	50
2114	15'	08/09/01	5.7J
2115	9'	08/09/01	2.5J
2115	15'	08/09/01	1.7J
2116	9'	08/09/01	1.9J
2116	15'	08/09/01	21U
2116 Dup	15'	08/09/01	1.0J
2117	9'	08/10/01	1.9J
2117	15'	08/10/01	8.1J
2118	9'	08/10/01	14J

Table 5-2 (continued)

Building 367 Soil-Screening Results

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported PCE ug/kg*
2118	15'	08/10/01	37J
2119	9'	08/10/01	4.2J
2119	15'	08/10/01	12J
2119 Dup	15'	08/10/01	17J
2125	9'	08/22/01	22
2125	15'	08/22/01	21U
2126	9'	08/22/01	16J
2126	15'	08/22/01	21U
2127	9'	08/22/01	21
2127	15'	08/22/01	4.4J
2129	9'	08/15/01	4.6J
2129	15'	08/15/01	8.0J
2130	9'	08/15/01	25
2130	15'	08/15/01	34
2131	9'	08/09/01	6.3J
2131	15'	08/09/01	9.7J
2132	9'	08/09/01	72
2132	15'	08/09/01	6.3J
2133	9'	08/09/01	2.3J
2133	15'	08/09/01	4.2J
2134	9'	08/10/01	54
2134	15'	08/10/01	11J
2135	9'	08/13/01	5.0J
2135	15'	08/13/01	27
2136	9'	08/13/01	21
2136	15'	08/13/01	54
2137	9'	08/10/01	5.0J
2137	15'	08/10/01	7.1J
2141	9'	08/21/01	21
2141	15'	08/21/01	1.0J
2142	9'	08/21/01	16J
2142	15'	08/21/01	16J
2143	9'	08/21/01	20J
2143	15'	08/21/01	20J
2144	9'	08/21/01	160
2144	15'	08/21/01	2.7J
2146	9'	08/14/01	76
2146	15'	08/14/01	39
2147	9'	08/14/01	15J
2147	15'	08/14/01	21J
2148	9'	08/08/01	1.5J
2148	15'	08/08/01	13J

Table 5-2 (continued)
Building 367 Soil-Screening Results
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported PCE ug/kg*
2148 Dup	15'	08/08/01	17J
2149	9'	08/08/01	21U
2149	15'	08/08/01	1.3J
2150	9'	08/08/01	3.2J
2150	15'	08/08/01	0.7J
2151	9'	08/13/01	2.0J
2151	15'	08/13/01	2.5J
2152	9'	08/10/01	1.2J
2152 Dup	9'	08/10/01	1.9J
2152	15'	08/10/01	2.4J
2153	9'	08/10/01	25
2153	15'	08/10/01	21J
2154	9'	08/13/01	18J
2154	15'	08/13/01	14J
2159	9'	08/22/01	29
2159	15'	08/22/01	4.1J
2160	9'	08/22/01	19J
2160	15'	08/22/01	3.6J
2160 Dup	15'	08/22/01	4.4J
2161	9'	08/22/01	38
2161	15'	08/22/01	2.9J
2162	9'	08/21/01	47
2162	15'	08/21/01	7.5J
2162 Dup	15'	08/21/01	9.1J
2163	9'	08/21/01	18J
2163	15'	08/21/01	4.2J
2164	9'	08/08/01	14J
2164	15'	08/08/01	21U
2165	9'	08/08/01	11J
2165	15'	08/08/01	21U
2166	9'	08/08/01	5.0J
2166	15'	08/08/01	21U
2167	9'	08/08/01	24
2167	15'	08/08/01	8.8J
2168	9'	08/08/01	9.4J
2168	15'	08/08/01	3.9J
2169	9'	08/10/01	3.9J
2169	15'	08/10/01	26
2170	9'	08/13/01	1.2J
2170 Dup	9'	08/13/01	1.4J
2170	15'	08/13/01	42
2171	9'	08/13/01	33

Table 5-2 (continued)

Building 367 Soil-Screening Results

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported PCE ug/kg*
2171	15'	08/13/01	6.8J
2172	9'	08/13/01	25
2172	15'	08/13/01	9.3J
2173	9'	08/17/01	12J
2173 Dup	9'	08/17/01	14J
2174	9'	08/17/01	23
2174	15'	08/17/01	21U
2175	9'	08/17/01	16J
2175	15'	08/17/01	21U
2176	9'	08/17/01	48
2176	15'	08/17/01	1.9J
2177	9'	08/17/01	13
2177	15'	08/17/01	21U
2177 Dup	15'	08/17/01	21U
2178	9'	08/17/01	22
2178	15'	08/17/01	21U
2179	9'	08/17/01	4.2J
2179	15'	08/17/01	3.2J
2180	9'	08/14/01	12J
2180	15'	08/14/01	4.5J
2181	9'	08/14/01	14J
2181	15'	08/14/01	9.6J
2182	9'	08/14/01	87
2182 Dup	9'	08/14/01	76
2182	15'	08/14/01	62
2183	9'	08/14/01	140
2183	15'	08/14/01	39
2184	9'	08/14/01	20J
2184	15'	08/14/01	3.3J
2185	9'	08/14/01	8.3J
2185	15'	08/14/01	12J
2186	9'	08/14/01	25
2186	15'	08/14/01	45
2187	9'	08/14/01	14J
2187	15'	08/14/01	12J
2188	9'	08/14/01	17J
2188	15'	08/14/01	15J
2189	9'	08/14/01	17J
2189 Dup	9'	08/14/01	17J
2189	15'	08/14/01	33
2195	9'	08/21/01	6.6J
2195	15'	08/21/01	21U

Table 5-2 (continued)

Building 367 Soil-Screening Results

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported PCE ug/kg*
2196	9'	08/21/01	22
2196	15'	08/21/01	21U
2197	9'	08/21/01	29
2197	15'	08/21/01	21U
2197 Dup	15'	08/21/01	21U
2198	9'	08/21/01	35
2198	15'	08/21/01	26
2199	9'	08/21/01	53
2199	15'	08/21/01	33
2200	9'	08/20/01	28
2200	15'	08/20/01	6.3J
2201	9'	08/20/01	4.5J
2201	15'	08/20/01	21
2202	9'	08/16/01	39
2202	15'	08/16/01	33
2203	9'	08/16/01	76
2203	15'	08/16/01	45
2204	9'	08/16/01	6.4J
2204	15'	08/16/01	29
2205	9'	08/16/01	22
2205	15'	08/16/01	25
2206	9'	08/16/01	34
2206 Dup	9'	08/16/01	31
2206	15'	08/16/01	12J
2207	9'	08/16/01	30
2207	15'	08/16/01	7.8J
2216	9'	08/20/01	23
2216	15'	08/20/01	7.4J
2217	9'	08/20/01	11J
2217	15'	08/20/01	13J
2218	9'	08/20/01	30
2218	15'	08/20/01	19J
2219	9'	08/20/01	30
2219	15'	08/20/01	1.3J
2219 Dup	15'	08/20/01	1.3J
2220	9'	08/20/01	23
2220	15'	08/20/01	15J
2221	9'	08/17/01	32
2221	15'	08/17/01	2.9J
2222	9'	08/20/01	25
2222	15'	08/20/01	21J
2223	9'	08/20/01	12J

Table 5-2 (continued)

Building 367 Soil-Screening Results

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported PCE ug/kg*
2223	15'	08/20/01	9.0J
2224	9'	08/20/01	7.8J
2224	15'	08/20/01	5.5J
2224 Dup	15'	08/20/01	6.3J
2228	9'	08/23/01	12J
2228	15'	08/23/01	21U
2228 Dup	15'	08/23/01	21U
2230	9'	08/23/01	5.3J
2230	15'	08/23/01	21U
2232	9'	08/23/01	5.7J
2232	15'	08/23/01	21U
2234	9'	08/23/01	11J
2234	15'	08/23/01	7.0J
2236	9'	08/23/01	5.1J
2236	15'	08/23/01	21U
2238	9'	08/22/01	4.8J
2238	15'	08/22/01	1.4J
2240	9'	08/22/01	18J
2240	15'	08/22/01	24
2242	9'	08/22/01	8.2J
2242	15'	08/22/01	21U
2248	9'	08/23/01	3.6J
2248	15'	08/23/01	21U
2248 Dup	15'	08/23/01	21U
2250	9'	08/23/01	16J
2250	15'	08/23/01	21U
2250 Dup	15'	08/23/01	21U
2251	9'	08/24/01	3.0J
2251	15'	08/24/01	21U
2252	9'	08/23/01	51
2252	15'	08/23/01	6.7J
2253	9'	08/24/01	4.3J
2253	15'	08/24/01	21U
2253 Dup	15'	08/24/01	21U
2254	9'	08/23/01	24
2254	15'	08/23/01	1.5J
2256	9'	08/23/01	56
2256	15'	08/23/01	41
2258	9'	08/23/01	44
2258	15'	08/23/01	21U
2260	9'	08/07/01	21U
2260	15'	08/07/01	1.7J

Table 5-2 (continued)

Building 367 Soil-Screening Results

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported PCE ug/kg*
2261	9'	07/27/01	21U
2261	15'	07/27/01	14J
2262	9'	07/27/01	21U
2262	15'	07/27/01	1.4J
2263	9'	07/27/01	21U
2263	15'	07/27/01	1.2J
2264	9'	07/27/01	21U
2264	15'	07/27/01	21U
2267	9'	08/07/01	21U
2267	15'	08/07/01	21U
2268	9'	08/08/01	7.1J
2268	15'	08/08/01	5.0J
2269	9'	07/27/01	20J
2269	15'	07/27/01	57
2269 Dup	15'	07/27/01	24
2270	9'	07/27/01	21U
2270	15'	07/27/01	21U
2271	9'	07/27/01	2.3J
2271	15'	07/27/01	21U
2271 Dup	15'	07/27/01	21U
2272	9'	07/27/01	1.9J
2272	15'	07/27/01	21U
2276	9'	08/07/01	1.7J
2276	15'	08/07/01	2.1J
2276 Dup	15'	08/07/01	1.7J
2277	9'	07/27/01	4.6J
2277	15'	07/27/01	3.9J
2278	9'	07/25/01	9.0J
2278	15'	07/25/01	18J
2279	9'	07/24/01	4.3J
2279	15'	07/24/01	21U
2280	9'	07/25/01	3.2J
2280	15'	07/25/01	21U
2280 Dup	15'	07/25/01	21U
2281	9'	08/01/01	2.6J
2281	15'	08/01/01	12J
2282	9'	08/08/01	21U
2282	15'	08/08/01	21U
2284	9'	08/08/01	14J
2284	15'	08/08/01	5.3J
2284 Dup	15'	08/08/01	7.8J
2285	9'	07/27/01	22

Table 5-2 (continued)
Building 367 Soil-Screening Results

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported PCE ug/kg*
2285	15'	07/27/01	2.2J
2286	9'	07/25/01	290
2286	15'	07/25/01	21U
2287	9'	07/25/01	9.7J
2287	15'	07/25/01	2.2J
2288	9'	07/24/01	4.3J
2288	15'	07/24/01	21U
2289	9'	07/26/01	21U
2289	15'	07/26/01	2.1J
2290	9'	08/01/01	21U
2290	15'	08/01/01	5.3J
2296	9'	07/27/01	36
2296	15'	07/27/01	21U
2297	9'	07/25/01	17J
2297	15'	07/25/01	1.9J
2298	9'	07/25/01	27
2298	15'	07/25/01	5.7J
2299	9'	07/24/01	20J
2299	15'	07/24/01	2.2J
2301	9'	07/26/01	6.6J
2301	15'	07/26/01	25
2302	9'	08/01/01	21U
2302	15'	08/01/01	5.1J
2308	9'	07/27/01	48
2308	15'	07/27/01	9.1J
2309	9'	07/25/01	77
2309	15'	07/25/01	21U
2310	9'	07/25/01	96
2310	15'	07/25/01	4.3J
2311	9'	07/25/01	130
2311	15'	07/25/01	3.0J
2312	9'	07/24/01	78
2312	15'	07/24/01	21U
2312 Dup	15'	07/24/01	2.4J
2313	9'	07/24/01	65
2313	15'	07/24/01	21U
2314	9'	07/26/01	13J
2314	15'	07/26/01	16J
2315	9'	08/01/01	3.5J
2315 Dup	9'	08/01/01	3.3J
2315	15'	08/01/01	21U
2320	9'	07/25/01	120

Table 5-2 (continued)

Building 367 Soil-Screening Results

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported PCE ug/kg*
2320	15'	07/25/01	13J
2320 Dup	15'	07/25/01	11J
2321	9'	07/25/01	160
2321	15'	07/25/01	2.1J
2321 Dup	15'	07/25/01	2.7J
2322	9'	07/25/01	210
2322	15'	07/25/01	36
2323	9'	07/24/01	51
2323	15'	07/24/01	21U
2324	9'	07/24/01	140
2324	15'	07/24/01	2.8J
2325	9'	07/24/01	200
2325	15'	07/24/01	7.7J
2326	9'	07/26/01	1.0J
2326	15'	07/26/01	14J
2327	9'	08/01/01	21U
2327	15'	08/01/01	17J
2332	9'	08/02/01	110
2332	15'	08/02/01	14J
2333	9'	07/26/01	140
2334	9'	07/26/01	230
2334	15'	07/26/01	55
2335	9'	07/26/01	580
2335	15'	07/26/01	110
2336	9'	07/26/01	710
2336	15'	07/26/01	2.9J
2337	9'	07/26/01	570
2337	15'	07/26/01	610
2337 Dup	15'	07/26/01	7.1J
2338	9'	07/26/01	24
2338	15'	07/26/01	7.0J
2339	9'	07/26/01	22
2339	15'	07/26/01	21U
2339 Dup	15'	07/26/01	1.0J
2340	9'	07/26/01	1.6J
2340	15'	07/26/01	4.6J
2344	9'	08/06/01	140
2344	15'	08/06/01	29
2345	9'	07/30/01	500
2345	15'	07/30/01	33
2347	9'	07/30/01	820E
2347	9'	07/30/01	1200E (1:2 dilution)

Table 5-2 (continued)

Building 367 Soil-Screening Results

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported PCE ug/kg*
2347	15'	07/30/01	19J
2348	9'	07/30/01	130
2348	15'	07/30/01	160
2348 Dup	15'	07/30/01	2.1J
2349	9'	07/30/01	170
2349	15'	07/30/01	20J
2350	9'	07/30/01	280
2350	15'	07/30/01	18J
2351	9'	07/31/01	21U
2351	15'	07/31/01	21U
2352	9'	08/07/01	21U
2352	15'	08/07/01	53
2353	9'	08/23/01	1.3J
2353	15'	08/23/01	15J
2353 Dup	15'	08/23/01	18J
2356	9'	07/30/01	110
2356	15'	07/30/01	33
2357	9'	07/31/01	160
2357	15'	07/31/01	2.3J
2358	9'	07/30/01	300
2358	15'	07/30/01	38
2359	9'	07/30/01	770E
2359	15'	07/30/01	180
2360	9'	07/31/01	370 (1:2 dilution)
2360 Dup	9'	07/31/01	300
2360 Dup	9'	07/31/01	280
2360	15'	07/31/01	54
2361	9'	07/31/01	11J
2361	15'	07/31/01	21U
2362	9'	07/31/01	19J
2362	15'	07/31/01	7.8J
2363	9'	07/31/01	16J
2363	15'	07/31/01	21U
2364	9'	07/31/01	21U
2364	15'	07/31/01	21U
2365	9'	07/31/01	21U
2365 Dup	9'	07/31/01	21U
2365	15'	07/31/01	17J
2368	9'	07/31/01	28
2368	15'	07/31/01	21U
2369	9'	07/31/01	290
2369	15'	07/31/01	21U

Table 5-2 (continued)
Building 367 Soil-Screening Results
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported PCE ug/kg*
2370	9'	07/30/01	280
2370	15'	07/30/01	4.9J
2370 Dup	15'	07/30/01	6.2J
2371	9'	07/31/01	150
2371	15'	07/31/01	21U
2372	9'	07/31/01	30
2372 Dup	9'	07/31/01	37
2372	15'	07/31/01	1.8J
2373	9'	07/31/01	10J
2373	15'	07/31/01	21U
2374	9'	08/01/01	21U
2374	15'	08/01/01	21U
2375	9'	08/01/01	21U
2375	15'	08/01/01	21U
2380	9'	08/01/01	32
2380 Dup	9'	08/01/01	39
2380	15'	08/01/01	21U
2381	9'	08/01/01	180
2381	15'	08/01/01	21U
2382	9'	08/01/01	29
2382	15'	08/01/01	21U
2383	9'	07/30/01	120
2383	15'	07/30/01	4.4J
2384	9'	08/01/01	7.3J
2384	15'	08/01/01	21U
2385	9'	08/01/01	9.7J
2385	15'	08/01/01	21U
2386	9'	08/01/01	59
2386 Dup	9'	08/01/01	55
2386	15'	08/01/01	21U
2387	9'	08/02/01	51
2387	15'	08/02/01	21U
2388	9'	08/02/01	23
2388	15'	08/02/01	21U
2389	9'	08/02/01	13J
2389	15'	08/02/01	21U
2390	9'	08/02/01	21U
2390	15'	08/02/01	6.3J
2391	9'	08/02/01	1.6J
2391 Dup	9'	08/02/01	21U
2391	15'	08/02/01	21U
2392	9'	08/02/01	79

Table 5-2 (continued)

Building 367 Soil-Screening Results

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Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported PCE ug/kg*
2392 Dup	9'	08/02/01	64
2392	15'	08/02/01	1.8J
2393	9'	08/02/01	64
2393	15'	08/02/01	2.1J
2394	9'	08/02/01	28
2394	15'	08/02/01	21U
2395	9'	08/02/01	26
2395	15'	08/02/01	1.5J
2396	9'	08/02/01	7.3J
2396	15'	08/02/01	17J
2397	9'	08/02/01	21U
2397	15'	08/02/01	2.5J
2398	9'	08/07/01	21U
2398	15'	08/07/01	2.6J
2406	9'	08/07/01	2.2J
2406 Dup	9'	08/07/01	2.9J
2406	15'	08/07/01	21U
2410	9'	08/06/01	20J
2410	15'	08/06/01	21U
2411	9'	08/06/01	29
2411 Dup	9'	08/06/01	34
2411	15'	08/06/01	21U
2412	9'	08/06/01	14J
2412	15'	08/06/01	21U
2413	9'	08/06/01	3.4J
2413	15'	08/06/01	21U
2414	9'	08/06/01	21U
2414	15'	08/06/01	21U
2415	9'	08/06/01	21U
2415	15'	08/06/01	1.9J
2419	9'	08/06/01	14
2419 Dup	9'	08/06/01	17
2419	15'	08/06/01	21U
2420	9'	08/07/01	21U
2420	15'	08/07/01	21U
2421	9'	08/07/01	6.1J
2421 Dup	9'	08/07/01	5.5J
2421	15'	08/07/01	21U
2422	9'	08/06/01	6.8J
2422	15'	08/06/01	21U
2423	9'	08/06/01	1.5J
2423	15'	08/06/01	21U

Table 5-2 (continued)
Building 367 Soil-Screening Results
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported PCE ug/kg*			
2424	9'	08/06/01	21U			
2424	15'	08/06/01	21U			
2430	9'	08/07/01	21U			
2430	15'	08/07/01	21U			
2431	9'	08/07/01	1.6J			
2431	15'	08/07/01	21U			
2432	9'	08/07/01	1.7J			
2432	15'	08/07/01	21U			
2433	9'	08/07/01	21U			
2433	15'	08/07/01	21U			
2442	9'	08/08/01	21U			
2442	15'	08/08/01	2.1J			
2450	9'	08/24/01	21U			
2450	15'	08/24/01	21U			
2452	9'	08/24/01	21U			
2452	15'	08/24/01	21U			
2453	9'	08/24/01	18J			
2453	15'	08/24/01	21U			
2454	9'	08/24/01	9.4J			
2454	15'	08/24/01	9.5J			
2456	9'	08/24/01	28			
2456 Dup	9'	08/24/01	29			
2456	15'	08/24/01	4.5J			
2457	9'	08/24/01	14J			
2457	15'	08/24/01	21U			
2457 Dup	15'	08/24/01	1.0J			
2458	9'	08/24/01	9.0J			
2458	15'	08/24/01	6.1J			
2459	9'	08/24/01	16J			
2459	15'	08/24/01	3.2J			
2460	9'	08/24/01	8.9J			
2460	15'	08/24/01	21U			
2462	9'	08/24/01	3.2J			
2462	15'	08/24/01	1.6J			
2462 Dup	15'	08/24/01	1.3J			
			PCE	*TCE*	*BTEX*	*CCl_4*
1401	13'	08/29/01	21U	21U	21U	21U
1402	13'	08/29/01	21U	21U	21U	21U
1402 Dup	13'	08/29/01	21U	21U	21U	21U
1403	13'	08/29/01	21U	21U	21U	21U
1400	13'	08/29/01	21U	21U	21U	21U
1399	13'	08/29/01	21U	21U	21U	21U
1399	13'	08/29/01	21U	21U	21U	21U
1398	13'	08/29/01	21U	21U	21U	21U

Table 5-2 (continued)

Building 367 Soil-Screening Results

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported PCE ug/kg*

Notes:

All results rounded to two significant digits.

BTEX - Benzene, Toluene, Ethylbenzene, meta-,para- and ortho-Xylenes

CCl_4 - Carbon Tetrachloride

E - Estimated value above the calibration range

J - Estimated value below reporting limit

PCE - Tetrachloroethene

TCE - Trichloroethene

U - Undetected by EPS

ug/kg - micrograms per kilogram

Table 5-3
Building 367 Soil-Sampling Results
Locations B2144S - B2347S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B2144/SB01	B2144/SB01	B2144/SB02	B2144/SB02	B2144/SB02R	B2144/SB11R	B2144/SB03	B2144/SB03
			Date Sampled:	10/31/2001	10/31/2001	10/31/2001	10/31/2001	10/23/2002	10/23/2002	10/31/2001	10/31/2001
			Sample Depth From:	0	0	1	1	1	1	4	4
			Sample Depth To:	1	1	4	4	4	4	7	7
			Laboratory Number:	01103285	01103285R Re-analysis	01103286	01103286R Re-analysis	02102117 Re-sampling	02102118 Duplicate	01103287	01103287R Re-analysis
		RSK Soil Pathway	RSK Soil to GW Pathway								
PAHs	UNITS										
Benzo(a)anthracene	mg/kg	12	10	0.2 U	NA	0.2 U	NA	NA	NA	0.4 U	NA
Benzo(a)pyrene	mg/kg	1.2	16	0.1 U	NA	0.1 U	NA	NA	NA	0.2 U	NA
Benzo(b)fluoranthene	mg/kg	12	19	0.1 U	NA	0.1 U	NA	NA	NA	0.2 U	NA
Benzo(g,h,i)perylene	mg/kg	--	--	**0.1**	NA	0.1 U	NA	NA	NA	0.2 U	NA
Benzo(k)fluoranthene	mg/kg	10	10	0.1 U	NA	0.1 U	NA	NA	NA	0.2 U	NA
Chrysene	mg/kg	6.4	6.4	**0.3**	NA	**0.4**	NA	NA	NA	**0.6**	NA
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.1 U	NA	0.1 U	NA	NA	NA	0.2 U	NA
Fluoranthene	mg/kg	220	220	0.2 U	NA	0.2 U	NA	NA	NA	0.5 U	NA
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.1 U	NA	0.1 U	NA	NA	NA	0.2 U	NA
Naphthalene	mg/kg	100	39	1 U	NA	1 U	NA	NA	NA	2 U	NA
Phenanthrene	mg/kg	--	--	0.6 U	NA	**0.8**	NA	NA	NA	1 U	NA
Pyrene	mg/kg	140	140	0.2 U	NA	0.2 U	NA	NA	NA	0.5 U	NA
Volatiles	UNITS										
Acetone	ug/kg	1,700,000	1,100	110 UJ	110 UJ	300 UJ	6,000 UR	NA	NA	300 UJ	60,000 UR
Carbon Disulfide	ug/kg	460,000	140	5.6 UJ	5.6 UJ	14 UJ	300 UR	NA	NA	14 UJ	3,000 UR
cis-1,2-Dichloroethene	ug/kg	57,000	800	**57.6 J**	**60.7 J**	**266 J**	300 UR	NA	NA	**827 J**	3,000 UR
m,p-Xylene	ug/kg	700,000	700,000	**5.7 J**	**6.4 J**	14 UJ	300 UR	NA	NA	14 UJ	3,000 UR
Tetrachloroethene	ug/kg	79,000	180	**64.4 J**	76 R	**OVERCAL**	1,010 R	**1,270**	**2,140**	**OVERCAL**	46,300 R
trans-1,2-Dichloroethene	ug/kg	94,000	1,500	5.6 UJ	5.6 UJ	14 UJ	300 UR	NA	NA	14 UJ	3,000 UR
Trichloroethene	ug/kg	62,000	200	5.6 UJ	**7.1 J**	**186 J**	300 UR	NA	NA	**OVERCAL**	1,500 R

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold**.

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-3 (continued)
Building 367 Soil-Sampling Results
Locations B2144S - B2347S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B2144/SB03R	B2144/SB04	B2144/SB04R	B2183S/SB01	B2183S/SB02	B2183S/SB11	B2183/SB02R	B2183S/SB03
			Date Sampled:	10/23/2002	10/31/2001	10/23/2002	11/1/2001	11/1/2001	11/1/2001	10/23/2002	11/1/2001
			Sample Depth From:	4	7	7	0	1	1	1	4
			Sample Depth To:	7	10	10	1	4	4	4	7
			Laboratory Number:	02102116 Re-sampling	01103288	02102115 Re-sampling	01110158	01110159	01110162 Duplicate	02102112 Re-sampling	01110160
		RSK Soil Pathway	RSK Soil to GW Pathway								
PAHs	UNITS										
Benzo(a)anthracene	mg/kg	12	10	NA	0.01 U	NA	0.01 U	0.01 U	0.01 U	NA	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	NA	0.01 U	NA	0.01 U	0.01 U	0.01 U	NA	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	NA	0.01 U	NA	0.01 U	0.01 U	0.01 U	NA	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	NA	0.01 U	NA	0.01 U	0.01 U	0.01 U	NA	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	NA	0.01 U	NA	0.01 U	0.01 U	0.01 U	NA	0.01 U
Chrysene	mg/kg	6.4	6.4	NA	0.01 U	NA	0.01 U	0.01 U	0.01 U	NA	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	NA	0.01 U	NA	0.01 U	0.01 U	0.01 U	NA	0.01 U
Fluoranthene	mg/kg	220	220	NA	0.02 U	NA	0.02 U	0.02 U	0.02 U	NA	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	NA	0.01 U	NA	0.01 U	0.01 U	0.01 U	NA	0.01 U
Naphthalene	mg/kg	100	39	NA	0.1 U	NA	0.1 U	0.1 U	0.1 U	NA	0.1 U
Phenanthrene	mg/kg	--	--	NA	0.06 U	NA	0.06 U	0.06 U	0.06 U	NA	0.06 U
Pyrene	mg/kg	140	140	NA	0.02 U	NA	0.02 U	0.02 U	0.02 U	NA	0.02 U
Volatiles	UNITS										
Acetone	ug/kg	1,700,000	1,100	NA	110 U	NA	120 U	120 U	120 U	NA	120 U
Carbon Disulfide	ug/kg	460,000	140	NA	5.6 U	NA	6 U	6 U	6.1 U	NA	5.9 U
cis-1,2-Dichloroethene	ug/kg	57,000	800	NA	5.6 U	NA	6 U	6 U	6.1 U	NA	5.9 U
m,p-Xylene	ug/kg	700,000	700,000	NA	5.6 U	NA	6 U	6 U	6.1 U	NA	5.9 U
Tetrachloroethene	ug/kg	79,000	180	**47.6**	6.6 R	5.7 U	**109**	105 R	126 R	**110**	34 R
trans-1,2-Dichloroethene	ug/kg	94,000	1,500	NA	5.6 U	NA	6 U	6 U	6.1 U	NA	5.9 U
Trichloroethene	ug/kg	62,000	200	6 U	5.6 U	NA	6 U	6 U	6.1 U	NA	5.9 U

Notes:
1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-3 (continued)
Building 367 Soil-Sampling Results
Locations B2144S - B2347S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Point:				B2183/SB03R	B2183S/SB04	B2183/SB04R	B2203/SB01	B2203/SB01	B2203/SB01R	B2203/SB02	B2203/SB02R
Date Sampled:				10/23/2002	11/1/2001	10/23/2002	10/31/2001	10/31/2001	10/23/2002	10/31/2001	10/23/2002
Sample Depth From:				4	7	7	0	0	0	1	1
Sample Depth To:				7	10	10	1	1	1	4	4
Laboratory Number:				02102119R Re-sampling	01110161	02102114 Re-sampling	01103289	01103289R Re-analysis	02102111 Re-sampling	01103290	02102110 Re-sampling
		RSK Soil Pathway	RSK Soil to GW Pathway								
PAHs	UNITS										
Benzo(a)anthracene	mg/kg	12	10	NA	0.01 U	NA	**0.05**	NA	NA	0.01 U	NA
Benzo(a)pyrene	mg/kg	1.2	16	NA	0.01 U	NA	**0.06**	NA	NA	0.01 U	NA
Benzo(b)fluoranthene	mg/kg	12	19	NA	0.01 U	NA	**0.12**	NA	NA	0.01 U	NA
Benzo(g,h,i)perylene	mg/kg	--	--	NA	0.01 U	NA	**0.09**	NA	NA	0.01 U	NA
Benzo(k)fluoranthene	mg/kg	10	10	NA	0.01 U	NA	**0.05**	NA	NA	0.01 U	NA
Chrysene	mg/kg	6.4	6.4	NA	0.01 U	NA	**0.07**	NA	NA	0.01 U	NA
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	NA	0.01 U	NA	**0.03**	NA	NA	0.01 U	NA
Fluoranthene	mg/kg	220	220	NA	0.02 U	NA	**0.1**	NA	NA	0.02 U	NA
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	NA	0.01 U	NA	**0.08**	NA	NA	0.01 U	NA
Naphthalene	mg/kg	100	39	NA	0.1 U	NA	0.1 U	NA	NA	0.1 U	NA
Phenanthrene	mg/kg	--	--	NA	0.05 U	NA	**0.27**	NA	NA	0.06 U	NA
Pyrene	mg/kg	140	140	NA	0.02 U	NA	**0.1**	NA	NA	0.02 U	NA
Volatiles	UNITS										
Acetone	ug/kg	1,700,000	1,100	NA	110 U	NA	**130 J**	120 UR	NA	120 U	NA
Carbon Disulfide	ug/kg	460,000	140	NA	5.5 U	NA	**6.1 J**	5.9 UR	NA	6.1 U	NA
cis-1,2-Dichloroethene	ug/kg	57,000	800	NA	5.5 U	NA	5.9 UJ	5.9 UR	NA	6.1 U	NA
m,p-Xylene	ug/kg	700,000	700,000	NA	5.5 U	NA	5.9 UJ	5.9 UR	NA	6.1 U	NA
Tetrachloroethene	ug/kg	79,000	180	**6.4**	5.5 UR	5.2 U	58.4 R	17 R	**100**	106 R	**83.6**
trans-1,2-Dichloroethene	ug/kg	94,000	1,500	NA	5.5 U	NA	5.9 UJ	5.9 UR	NA	6.1 U	NA
Trichloroethene	ug/kg	62,000	200	NA	5.5 U	NA	**8.6 J**	5.9 UR	NA	6.1 U	NA

Notes:
1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold**.

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-3 (continued)
Building 367 Soil-Sampling Results
Locations B2144S - B2347S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B2203/SB03	B2203/SB03R	B2203/SB04	B2203/SB04	B2203/SB04R	B2322S/SB01	B2322S/SB01	B2322S/SB02
			Date Sampled:	10/31/2001	10/23/2002	10/31/2001	10/31/2001	10/23/2002	11/8/2001	11/8/2001	11/8/2001
			Sample Depth From:	4	4	7	7	7	0	0	1
			Sample Depth To:	7	7	10	10	10	1	1	4
			Laboratory Number:	01103291	02102109 Re-sampling	01103292	01103292R Re-analysis	02102108 Re-sampling	01110736	01110736R Re-analysis	01110737
		RSK Soil Pathway	RSK Soil to GW Pathway								
PAHs	UNITS										
Benzo(a)anthracene	mg/kg	12	10	0.01 U	NA	0.01 UJ	0.01 UR	NA	**0.03**	NA	**0.01**
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	NA	0.01 UJ	0.01 UR	NA	**0.02**	NA	**0.01**
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	NA	0.01 UJ	0.01 UR	NA	**0.03**	NA	**0.02**
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	NA	0.01 UJ	0.01 UR	NA	**0.02**	NA	**0.01**
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	NA	0.01 UJ	0.01 UR	NA	**0.02**	NA	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U	NA	0.01 UJ	0.01 UR	NA	**0.04 J**	NA	**0.01 J**
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	NA	0.01 UJ	0.01 UR	NA	0.01 U	NA	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U	NA	0.02 UJ	0.02 UR	NA	**0.07**	NA	**0.02**
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	NA	0.01 UJ	0.01 UR	NA	**0.02**	NA	0.01 U
Naphthalene	mg/kg	100	39	0.1 U	NA	0.1 UJ	0.1 UR	NA	0.1 U	NA	0.1 U
Phenanthrene	mg/kg	--	--	0.06 U	NA	0.06 UJ	0.06 UR	NA	0.09 R	NA	0.09 R
Pyrene	mg/kg	140	140	0.02 U	NA	0.02 UJ	0.02 UR	NA	**0.06 J**	NA	0.02 UJ
Volatiles	UNITS										
Acetone	ug/kg	1,700,000	1,100	120 U	NA	110 U	NA	NA	120 UJ	6,000 U	120 UJ
Carbon Disulfide	ug/kg	460,000	140	6 U	NA	5.6 U	NA	NA	6 UJ	300 U	5.9 UJ
cis-1,2-Dichloroethene	ug/kg	57,000	800	6 U	NA	5.6 U	NA	NA	**103 J**	300 U	**52.6 J**
m,p-Xylene	ug/kg	700,000	700,000	6 U	NA	5.6 U	NA	NA	6 UJ	300 U	5.9 UJ
Tetrachloroethene	ug/kg	79,000	180	39.2 R	**73.7**	5.6 UR	NA	5.6 U	**OVERCAL**	**2,360**	**OVERCAL**
trans-1,2-Dichloroethene	ug/kg	94,000	1,500	6 U	NA	5.6 U	NA	NA	6 UJ	300 U	5.9 UJ
Trichloroethene	ug/kg	62,000	200	6 U	NA	5.6 U	NA	NA	**83.7 J**	300 U	**48.6 J**

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold**.

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-3 (continued)
Building 367 Soil-Sampling Results
Locations B2144S - B2347S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B2322S/SB02	B2322S/SB03	B2322S/SB03	B2322S/SB04	B2322S/SB11	B2325S/SB01	B2325S/SB01	B2325S/SB02
			Date Sampled:	11/8/2001	11/8/2001	11/8/2001	11/8/2001	11/8/2001	11/8/2001	11/8/2001	11/8/2001
			Sample Depth From:	1	4	4	7	7	0	0	1
			Sample Depth To:	4	7	7	10	10	1	1	4
			Laboratory Number:	01110737R Re-analysis	01110738	01110738R Re-analysis	01110739	01110740 Duplicate	01110741	01110741R Re-analysis	01110742
		RSK Soil Pathway	RSK Soil to GW Pathway								
PAHs	UNITS										
Benzo(a)anthracene	mg/kg	12	10	NA	0.01 U	NA	0.01 U	0.01 U	**0.1**	NA	**0.01**
Benzo(a)pyrene	mg/kg	1.2	16	NA	0.01 U	NA	0.01 U	0.01 U	**0.1**	NA	**0.01**
Benzo(b)fluoranthene	mg/kg	12	19	NA	0.01 U	NA	0.01 U	0.01 U	**0.1**	NA	**0.02**
Benzo(g,h,i)perylene	mg/kg	--	--	NA	0.01 U	NA	0.01 U	0.01 U	**0.08**	NA	**0.01**
Benzo(k)fluoranthene	mg/kg	10	10	NA	0.01 U	NA	0.01 U	0.01 U	**0.04**	NA	0.01 U
Chrysene	mg/kg	6.4	6.4	NA	0.01 UJ	NA	0.01 UJ	0.01 UJ	**0.1 J**	NA	**0.02 J**
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	NA	0.01 U	NA	0.01 U	0.01 U	0.01 U	NA	0.01 U
Fluoranthene	mg/kg	220	220	NA	0.02 U	NA	0.02 U	0.02 U	**0.19**	NA	**0.02**
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	NA	0.01 U	NA	0.01 U	0.01 U	**0.06**	NA	0.01 U
Naphthalene	mg/kg	100	39	NA	0.1 U	NA	0.1 U	0.1 U	**0.1**	NA	0.1 U
Phenanthrene	mg/kg	--	--	NA	0.06 UR	NA	0.06 UR	0.06 UR	0.33 R	NA	0.08 R
Pyrene	mg/kg	140	140	NA	0.02 UJ	NA	0.02 UJ	0.02 UJ	**0.2 J**	NA	**0.03 J**
Volatiles	UNITS										
Acetone	ug/kg	1,700,000	1,100	6,000 U	120 UJ	300 U	120 U	120 U	300 UJ	300 U	120 UJ
Carbon Disulfide	ug/kg	460,000	140	300 U	6.1 UJ	15 U	5.8 U	5.8 U	14 UJ	14 U	5.9 UJ
cis-1,2-Dichloroethene	ug/kg	57,000	800	300 U	**27.6 J**	**23**	**12**	**30.3**	**397 J**	**116**	**197 J**
m,p-Xylene	ug/kg	700,000	700,000	300 U	6.1 UJ	15 U	5.8 U	5.8 U	14 UJ	14 U	5.9 UJ
Tetrachloroethene	ug/kg	79,000	180	**1,400**	**312 J**	**311**	**19**	**59.1**	**50 J**	**20**	**404 J**
trans-1,2-Dichloroethene	ug/kg	94,000	1,500	300 U	6.1 UJ	15 U	5.8 U	5.8 U	**24 J**	14 U	5.9 UJ
Trichloroethene	ug/kg	62,000	200	300 U	**10 J**	15 U	5.8 U	5.8 U	**16 J**	14 U	**38.9 J**

Notes:
1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-3 (continued)
Building 367 Soil-Sampling Results
Locations B2144S - B2347S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B2325S/SB02	B2325S/SB03	B2325S/SB04	B2333S/SB01	B2333S/SB02	B2333S/SB03	B2333S/SB04	B2335S/SB01
			Date Sampled:	11/8/2001	11/8/2001	11/8/2001	11/7/2001	11/7/2001	11/7/2001	11/7/2001	11/6/2001
			Sample Depth From:	1	4	7	0	1	4	7	0
			Sample Depth To:	4	7	10	1	4	7	10	1
			Laboratory Number:	01110742R Re-analysis	01110743	01110744	01110636	01110637	01110638	01110639	01110570
		RSK Soil Pathway	RSK Soil to GW Pathway								
PAHs	UNITS										
Benzo(a)anthracene	mg/kg	12	10	NA	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	0.01 U	**0.02 J**
Benzo(a)pyrene	mg/kg	1.2	16	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.02 J**
Benzo(b)fluoranthene	mg/kg	12	19	NA	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U	**0.02 J**
Benzo(g,h,i)perylene	mg/kg	--	--	NA	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	0.01 U	**0.01 J**
Benzo(k)fluoranthene	mg/kg	10	10	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ
Chrysene	mg/kg	6.4	6.4	NA	0.01 UJ	0.01 UJ	**0.02 J**	0.01 UJ	0.01 UJ	0.01 UJ	**0.02 J**
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ
Fluoranthene	mg/kg	220	220	NA	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	**0.02 J**
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ
Naphthalene	mg/kg	100	39	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ
Phenanthrene	mg/kg	--	--	NA	0.06 UR	0.06 UR	0.13 R	0.06 UR	0.06 UR	0.06 UR	0.07 R
Pyrene	mg/kg	140	140	NA	0.02 UJ	0.02 UJ	0.02 UJ	0.02 UJ	0.02 UJ	0.02 UJ	**0.02 J**
Volatiles	UNITS										
Acetone	ug/kg	1,700,000	1,100	120 U	120 U	110 U	300 U	310 U	300 U	110 U	120 U
Carbon Disulfide	ug/kg	460,000	140	5.9 U	5.9 U	5.6 U	14 U	15 U	14 U	5.5 U	5.9 U
cis-1,2-Dichloroethene	ug/kg	57,000	800	**120**	**53.1**	**6.3**	14 U	15 U	14 U	5.5 U	**OVERCAL**
m,p-Xylene	ug/kg	700,000	700,000	5.9 U	5.9 U	5.6 U	14 U	15 U	14 U	5.5 U	5.9 U
Tetrachloroethene	ug/kg	79,000	180	▨ **308**	**78.3**	**17**	▨ **919**	▨ **608**	**175**	**6.9**	**OVERCAL**
trans-1,2-Dichloroethene	ug/kg	94,000	1,500	5.9 U	5.9 U	5.6 U	14 U	15 U	14 U	5.5 U	**29.2**
Trichloroethene	ug/kg	62,000	200	**25.8**	**6.7**	5.6 U	14 U	15 U	14 U	5.5 U	**184**

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   ▨ Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold**.

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-3 (continued)
Building 367 Soil-Sampling Results
Locations B2144S - B2347S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Point:				B2335S/SB01	B2335S/SB01	B2335/SB01R	B2335S/SB02	B2335S/SB02	B2335S/SB11	B2335S/SB11	B2335S/SB02R
Date Sampled:				11/6/2001	11/6/2001	10/23/2002	11/6/2001	11/6/2001	11/6/2001	11/6/2001	10/23/2002
Sample Depth From:				0	0	0	1	1	1	1	1
Sample Depth To:				1	1	1	4	4	4	4	4
Laboratory Number:				01110570R Re-analysis	01111876 Re-analysis	02102105 Re-sampling	01110571	01110571R Re-analysis	01110574 Duplicate	01110574R Re-analysis	02102106 Re-sampling
		RSK Soil Pathway	RSK Soil to GW Pathway								
PAHs	UNITS										
Benzo(a)anthracene	mg/kg	12	10	**0.02 J**	0.05 R	NA	**0.02**	NA	**0.02**	NA	NA
Benzo(a)pyrene	mg/kg	1.2	16	**0.02 J**	0.05 R	NA	**0.02**	NA	**0.01**	NA	NA
Benzo(b)fluoranthene	mg/kg	12	19	**0.02 J**	0.06 R	NA	**0.04**	NA	**0.03**	NA	NA
Benzo(g,h,i)perylene	mg/kg	--	--	**0.01 J**	0.04 R	NA	**0.02**	NA	**0.01**	NA	NA
Benzo(k)fluoranthene	mg/kg	10	10	0.01 UJ	0.02 R	NA	0.01 U	NA	0.01 U	NA	NA
Chrysene	mg/kg	6.4	6.4	**0.02 J**	0.05 R	NA	**0.03**	NA	**0.02**	NA	NA
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 UJ	0.01 R	NA	0.01 U	NA	0.01 U	NA	NA
Fluoranthene	mg/kg	220	220	**0.02 J**	0.07 R	NA	**0.04**	NA	**0.02**	NA	NA
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 UJ	0.02 R	NA	0.01 U	NA	0.01 U	NA	NA
Naphthalene	mg/kg	100	39	0.1 UJ	0.1 UR	NA	0.1 U	NA	0.1 U	NA	NA
Phenanthrene	mg/kg	--	--	0.08 R	0.15 R	NA	0.13 R	NA	0.07 R	NA	NA
Pyrene	mg/kg	140	140	**0.02 J**	0.07 R	NA	**0.05**	NA	0.02 U	NA	NA
Volatiles	UNITS										
Acetone	ug/kg	1,700,000	1,100	24,000 UR	5,900 UJ	NA	120 UJ	6,000 UR	290 U	6,000 U	NA
Carbon Disulfide	ug/kg	460,000	140	1,200 UR	300 UJ	NA	5.9 UJ	300 UR	14 U	290 U	NA
cis-1,2-Dichloroethene	ug/kg	57,000	800	1,200 UR	**1,090 J**	NA	**262 J**	300 UR	**142 J**	**430 J**	NA
m,p-Xylene	ug/kg	700,000	700,000	1,200 UR	300 UJ	NA	5.9 UJ	300 UR	14 U	290 U	NA
Tetrachloroethene	ug/kg	79,000	180	12,400 R	**OVERCAL**	**13,200**	**OVERCAL**	4,470 R	**OVERCAL**	**7,740 J**	**8,850**
trans-1,2-Dichloroethene	ug/kg	94,000	1,500	1,200 UR	300 UJ	NA	5.9 UJ	300 UR	14 U	290 U	NA
Trichloroethene	ug/kg	62,000	200	1,200 UR	**756 J**	NA	**105 J**	300 UR	**66.7**	**340**	NA

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold**.

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-3 (continued)
Building 367 Soil-Sampling Results
Locations B2144S - B2347S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Point:				B2335S/SB11R	B2335S/SB03	B2335S/SB04	B2336S/SB01	B2336S/SB01	B2336S/SB02	B2336S/SB02	B2336S/SB03
Date Sampled:				10/23/2002	11/6/2001	11/6/2001	11/7/2001	11/7/2001	11/7/2001	11/7/2001	11/7/2001
Sample Depth From:				1	4	7	0	0	1	1	4
Sample Depth To:				4	7	10	1	1	4	4	7
Laboratory Number:				02102107 Re-sampling	01110572	01110573	01110630	01110630R Re-analysis	01110631	01110631R Re-analysis	01110632
		RSK Soil Pathway	RSK Soil to GW Pathway								
PAHs	UNITS										
Benzo(a)anthracene	mg/kg	12	10	NA	0.01 U	0.01 U	**0.03**	NA	0.01 U	NA	**0.08**
Benzo(a)pyrene	mg/kg	1.2	16	NA	0.01 U	0.01 U	**0.03**	NA	0.01 U	NA	**0.07**
Benzo(b)fluoranthene	mg/kg	12	19	NA	0.01 U	0.01 U	**0.04**	NA	0.01 U	NA	**0.12**
Benzo(g,h,i)perylene	mg/kg	--	--	NA	0.01 U	0.01 U	**0.03**	NA	0.01 U	NA	**0.05**
Benzo(k)fluoranthene	mg/kg	10	10	NA	0.01 U	0.01 U	**0.02**	NA	0.01 U	NA	**0.03**
Chrysene	mg/kg	6.4	6.4	NA	0.01 U	0.01 U	**0.04**	NA	0.01 U	NA	**0.1 J**
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	NA	0.01 U	0.01 U	0.01 U	NA	0.01 U	NA	0.01 U
Fluoranthene	mg/kg	220	220	NA	0.02 U	0.02 U	**0.07**	NA	0.02 U	NA	**0.14**
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	NA	0.01 U	0.01 U	**0.02**	NA	0.01 U	NA	**0.04**
Naphthalene	mg/kg	100	39	NA	0.1 U	0.1 U	0.1 U	NA	0.1 U	NA	0.1 U
Phenanthrene	mg/kg	--	--	NA	0.06 UR	0.06 UR	0.09 R	NA	0.06 UR	NA	0.48 R
Pyrene	mg/kg	140	140	NA	0.02 U	0.02 U	**0.1**	NA	0.02 U	NA	**0.13 J**
Volatiles	UNITS										
Acetone	ug/kg	1,700,000	1,100	NA	300 U	280 U	**180**	6,000 U	120 U	6,000 U	120 U
Carbon Disulfide	ug/kg	460,000	140	NA	14 U	13 U	**7**	300 U	5.9 U	300 U	6 U
cis-1,2-Dichloroethene	ug/kg	57,000	800	NA	**57 J**	**31 J**	**OVERCAL**	**1,480 J**	**OVERCAL**	**636 J**	**OVERCAL**
m,p-Xylene	ug/kg	700,000	700,000	NA	14 U	13 U	5.9 U	300 U	5.9 U	300 U	6 U
Tetrachloroethene	ug/kg	79,000	180	**29,000**	**328 J**	**65.7 J**	**11 J**	300 UJ	**OVERCAL**	**2,530 J**	**OVERCAL**
trans-1,2-Dichloroethene	ug/kg	94,000	1,500	NA	14 U	13 U	**34.4**	300 U	**6.2**	300 U	**6.5**
Trichloroethene	ug/kg	62,000	200	NA	14 U	13 U	5.9 U	300 U	**265**	300 U	**230**

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold**.

-- No regulatory value available
mg/kg - milligrams per kilogram
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J - Qualified as estimated
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OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
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Table 5-3 (continued)
Building 367 Soil-Sampling Results
Locations B2144S - B2347S

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Fort Riley, Kansas

			Sample Point:	B2336S/SB03	B2336S/SB11	B2336S/SB11	B2336S/SB04	B2337S/SB01	B2337S/SB01	B2337S/SB02	B2337S/SB02
			Date Sampled:	11/7/2001	11/7/2001	11/7/2001	11/7/2001	11/7/2001	11/7/2001	11/7/2001	11/7/2001
			Sample Depth From:	4	4	4	7	0	0	1	1
			Sample Depth To:	7	7	7	10	1	1	4	4
			Laboratory Number:	01110632R Re-analysis	01110634 Duplicate	01110634R Re-analysis	01110633	01110625	01110625R Re-analysis	01110626	01110626R Re-analysis
		RSK Soil Pathway	RSK Soil to GW Pathway								
PAHs	UNITS										
Benzo(a)anthracene	mg/kg	12	10	NA	**0.09**	NA	0.01 U	**0.04**	NA	0.01 U	NA
Benzo(a)pyrene	mg/kg	1.2	16	NA	**0.08**	NA	0.01 U	**0.04**	NA	0.01 U	NA
Benzo(b)fluoranthene	mg/kg	12	19	NA	**0.1**	NA	0.01 U	**0.06**	NA	**0.02**	NA
Benzo(g,h,i)perylene	mg/kg	--	--	NA	**0.06**	NA	0.01 U	**0.05**	NA	**0.02**	NA
Benzo(k)fluoranthene	mg/kg	10	10	NA	**0.04**	NA	0.01 U	**0.02**	NA	0.01 U	NA
Chrysene	mg/kg	6.4	6.4	NA	**0.09 J**	NA	0.01 UJ	**0.06**	NA	**0.02**	NA
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	NA	0.01 U	NA	0.01 U	0.01 U	NA	0.01 U	NA
Fluoranthene	mg/kg	220	220	NA	**0.17**	NA	0.02 U	**0.09**	NA	0.02 U	NA
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	NA	**0.05**	NA	0.01 U	**0.03**	NA	0.01 U	NA
Naphthalene	mg/kg	100	39	NA	0.1 U	NA	0.1 U	0.1 U	NA	0.1 U	NA
Phenanthrene	mg/kg	--	--	NA	0.36 R	NA	0.06 UR	0.25 R	NA	0.06 UR	NA
Pyrene	mg/kg	140	140	NA	**0.14 J**	NA	0.02 UJ	**0.07**	NA	0.02 U	NA
Volatiles	UNITS										
Acetone	ug/kg	1,700,000	1,100	6,000 U	120 U	6,000 U	110 U	120 U	6,000 U	120 U	6,000 U
Carbon Disulfide	ug/kg	460,000	140	300 U	6 U	300 U	5.7 U	5.8 U	290 U	6.2 U	310 U
cis-1,2-Dichloroethene	ug/kg	57,000	800	**626 J**	**OVERCAL**	**360 J**	**402 J**	**OVERCAL**	**8,120 J**	**OVERCAL**	**1,080 J**
m,p-Xylene	ug/kg	700,000	700,000	300 U	6 U	300 U	5.7 U	5.8 U	290 U	6.2 U	310 U
Tetrachloroethene	ug/kg	79,000	180	**714 J**	**OVERCAL**	**612 J**	**207 J**	**90.8 J**	**1,010 J**	**OVERCAL**	**3,640 J**
trans-1,2-Dichloroethene	ug/kg	94,000	1,500	300 U	6 U	300 U	5.7 U	**58.4**	290 U	**6.9**	310 U
Trichloroethene	ug/kg	62,000	200	300 U	**142**	300 U	**34.5**	**110**	**460**	**OVERCAL**	**733**

Notes:
1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold**.

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-3 (continued)
Building 367 Soil-Sampling Results
Locations B2144S - B2347S

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Fort Riley, Kansas

			Sample Point:	B2337S/SB03	B2337S/SB03	B2337S/SB04	B2337S/SB11	B2344S/SB01	B2344S/SB02	B2344S/SB03	B2344S/SB04
			Date Sampled:	11/7/2001	11/7/2001	11/7/2001	11/7/2001	11/2/2001	11/2/2001	11/2/2001	11/2/2001
			Sample Depth From:	4	4	7	7	0	1	4	7
			Sample Depth To:	7	7	10	10	1	4	7	10
			Laboratory Number:	01110627	01110627R Re-analysis	01110628	01110629 Duplicate	01110225	01110226	01110227	01110228
		RSK Soil Pathway	RSK Soil to GW Pathway								
PAHs	UNITS										
Benzo(a)anthracene	mg/kg	12	10	0.01 U	NA	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	NA	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	NA	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	NA	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U	NA	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U	NA	0.02 U	0.02 U	**0.04**	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Naphthalene	mg/kg	100	39	0.1 U	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Phenanthrene	mg/kg	--	--	0.06 UR	NA	0.05 UR	0.06 UR	**0.08**	0.06 U	0.06 U	0.06 U
Pyrene	mg/kg	140	140	0.02 U	NA	0.02 U	0.02 U	**0.03**	0.02 U	0.02 U	0.02 U
Volatiles	UNITS										
Acetone	ug/kg	1,700,000	1,100	120 U	6,000 U	110 U	110 U	120 U	300 U	120 U	110 U
Carbon Disulfide	ug/kg	460,000	140	6 U	300 U	5.4 U	5.6 U	5.9 U	14 U	6.1 U	5.6 U
cis-1,2-Dichloroethene	ug/kg	57,000	800	**OVERCAL**	**621 J**	**186 J**	**111 J**	5.9 UJ	14 UJ	6.1 U	5.6 U
m,p-Xylene	ug/kg	700,000	700,000	6 U	300 U	5.4 U	5.6 U	5.9 U	14 U	6.1 U	5.6 U
Tetrachloroethene	ug/kg	79,000	180	**OVERCAL**	**860 J**	**111 J**	**125 J**	**212 J**	**311 J**	**134**	**43.2**
trans-1,2-Dichloroethene	ug/kg	94,000	1,500	6 U	300 U	5.4 U	5.6 U	5.9 U	14 U	6.1 U	5.6 U
Trichloroethene	ug/kg	62,000	200	**262**	300 U	**19**	**13**	5.9 UJ	14 UJ	6.1 U	5.6 U

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold**.

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-3 (continued)
Building 367 Soil-Sampling Results
Locations B2144S - B2347S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B2345S/SB01	B2345S/SB01	B2345S/SB01R	B2345S/SB02	B2345S/SB02	B2345S/SB02R	B2345S/SB03	B2345S/SB04
			Date Sampled:	11/2/2001	11/2/2001	10/23/2002	11/2/2001	11/2/2001	10/23/2002	11/2/2001	11/2/2001
			Sample Depth From:	0	0	0	1	1	1	4	7
			Sample Depth To:	1	1	1	4	4	4	7	10
			Laboratory Number:	01110229	01110229R Re-analysis	02102104 Re-sampling	01110230	01110230R Re-analysis	02102103 Re-sampling	01110231	01110232
		RSK Soil Pathway	RSK Soil to GW Pathway								
PAHs	UNITS										
Benzo(a)anthracene	mg/kg	12	10	0.01 U	NA	NA	**0.02**	NA	NA	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	NA	NA	**0.02**	NA	NA	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	**0.01**	NA	NA	**0.03**	NA	NA	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	NA	NA	**0.02**	NA	NA	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	NA	NA	0.01 U	NA	NA	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U	NA	NA	**0.02**	NA	NA	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	NA	NA	0.01 U	NA	NA	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U	NA	NA	**0.04**	NA	NA	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	NA	NA	**0.01**	NA	NA	0.01 U	0.01 U
Naphthalene	mg/kg	100	39	0.1 U	NA	NA	0.1 U	NA	NA	0.1 U	0.1 U
Phenanthrene	mg/kg	--	--	0.06 U	NA	NA	**0.08**	NA	NA	0.06 U	0.06 U
Pyrene	mg/kg	140	140	0.02 U	NA	NA	**0.04**	NA	NA	0.02 U	0.02 U
Volatiles	UNITS										
Acetone	ug/kg	1,700,000	1,100	120 UJ	6,000 UR	NA	120 UJ	6,000 UR	NA	120 U	110 U
Carbon Disulfide	ug/kg	460,000	140	6.1 UJ	310 UR	NA	6 UJ	300 UR	NA	6 U	5.6 U
cis-1,2-Dichloroethene	ug/kg	57,000	800	**7.5 J**	310 UR	NA	**9.3 J**	300 UR	NA	6 U	5.6 U
m,p-Xylene	ug/kg	700,000	700,000	6.1 UJ	310 UR	NA	6 UJ	300 UR	NA	6 U	5.6 U
Tetrachloroethene	ug/kg	79,000	180	**OVERCAL**	2,390 R	**4,160**	**OVERCAL**	3,410 R	**1,120**	**79.4**	5.6 U
trans-1,2-Dichloroethene	ug/kg	94,000	1,500	6.1 UJ	310 UR	NA	6 UJ	300 UR	NA	6 U	5.6 U
Trichloroethene	ug/kg	62,000	200	**34.7 J**	310 UR	NA	**30 J**	300 UR	NA	6 U	5.6 U

Notes:
1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold.**

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ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-3 (continued)
Building 367 Soil-Sampling Results
Locations B2144S - B2347S
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Fort Riley, Kansas

Sample Point:				B2347S/SB01	B2347S/SB01	B2347S/SB02	B2347S/SB02	B2347S/SB11	B2347S/SB11	B2347S/SB03	B2347S/SB04
Date Sampled:				11/5/2001	11/5/2001	11/5/2001	11/5/2001	11/5/2001	11/5/2001	11/5/2001	11/5/2001
Sample Depth From:				0	0	1	1	1	1	4	7
Sample Depth To:				1	1	4	4	4	4	7	10
Laboratory Number:				01110293	01110293R Re-analysis	01110294	01110294R Re-analysis	01110297 Duplicate	01110297R Re-analysis	01110295	01110296
		RSK Soil Pathway	RSK Soil to GW Pathway								
PAHs	UNITS										
Benzo(a)anthracene	mg/kg	12	10	0.01 U	NA	0.01 UJ	0.01 UR	**0.07**	NA	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	NA	0.01 UJ	0.01 UR	**0.1**	NA	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	NA	**0.01 J**	0.02 R	**0.2**	NA	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	NA	0.01 UJ	0.01 UR	**0.1**	NA	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	NA	0.01 UJ	0.01 UR	0.05 U	NA	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U	NA	0.01 UJ	0.01 UR	0.05 U	NA	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	NA	0.01 UJ	0.01 UR	**0.06**	NA	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U	NA	0.02 UJ	0.02 UR	0.1 U	NA	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	NA	0.01 UJ	0.01 UR	0.05 U	NA	0.01 U	0.01 U
Naphthalene	mg/kg	100	39	0.1 U	NA	0.1 UJ	0.1 UR	0.5 U	NA	0.1 U	0.1 U
Phenanthrene	mg/kg	--	--	0.06 U	NA	0.06 UJ	0.06 UR	0.2 U	NA	0.06 U	0.06 U
Pyrene	mg/kg	140	140	0.02 U	NA	0.02 UJ	0.02 UR	**0.1**	NA	0.02 U	0.02 U
Volatiles	UNITS										
Acetone	ug/kg	1,700,000	1,100	120 UJ	6,000 UJ	120 UJ	6,000 U	120 UJ	6,000 U	300 U	110 U
Carbon Disulfide	ug/kg	460,000	140	5.8 UJ	290 UJ	6.1 UJ	300 U	6 UJ	300 U	14 U	5.7 U
cis-1,2-Dichloroethene	ug/kg	57,000	800	**OVERCAL**	**180 J**	**OVERCAL**	**320**	**409 J**	300 U	**312 J**	**152**
m,p-Xylene	ug/kg	700,000	700,000	5.8 UJ	290 UJ	6.1 UJ	300 U	6 UJ	300 U	14 U	5.7 U
Tetrachloroethene	ug/kg	79,000	180	**OVERCAL**	**1,030 J**	**OVERCAL**	**4,540 J**	**OVERCAL**	**4,870 J**	**817 J**	**262**
trans-1,2-Dichloroethene	ug/kg	94,000	1,500	5.8 UJ	290 UJ	6.1 UJ	300 U	6 UJ	300 U	14 U	5.7 U
Trichloroethene	ug/kg	62,000	200	**177 J**	290 UJ	**326 J**	**320**	**356 J**	300 U	**94.4 J**	**26.6**

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold**.

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-3 (continued)
Building 367 Soil-Sampling Results
Locations B2144S - B2347S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B2347S/SB05
			Date Sampled:	11/5/2001
			Sample Depth From:	16.5
			Sample Depth To:	17
			Laboratory Number:	01110303
		RSK Soil Pathway	RSK Soil to GW Pathway	
PAHs	UNITS			
Benzo(a)anthracene	mg/kg	12	10	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U
Naphthalene	mg/kg	100	39	0.1 U
Phenanthrene	mg/kg	--	--	0.05 U
Pyrene	mg/kg	140	140	0.02 U
Volatiles	UNITS			
Acetone	ug/kg	1,700,000	1,100	110 U
Carbon Disulfide	ug/kg	460,000	140	5.4 U
cis-1,2-Dichloroethene	ug/kg	57,000	800	**6.5 J**
m,p-Xylene	ug/kg	700,000	700,000	5.4 U
Tetrachloroethene	ug/kg	79,000	180	5.4 UJ
trans-1,2-Dichloroethene	ug/kg	94,000	1,500	5.4 U
Trichloroethene	ug/kg	62,000	200	5.4 UJ

Notes:
1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold**.

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ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-4
Building 367 Soil-Sampling Results
Locations B2350S - B2429S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B2350S/SB01	B2350S/SB01	B2350S/SB02	B2350S/SB02	B2350S/SB03	B2350S/SB04	B2358S/SB01	B2358S/SB01
			Date Sampled:	11/9/2001	11/9/2001	11/9/2001	11/9/2001	11/9/2001	11/9/2001	11/5/2001	11/5/2001
			Sample Depth From:	0	0	1	1	4	7	0	0
			Sample Depth To:	1	1	4	4	7	10	1	1
			Laboratory Number:	01110887	01110887R Re-analysis	01110888	01110888R Re-analysis	01110889	01110890	01110298	01110298R Re-analysis
		RSK Soil Pathway	RSK Soil to GW Pathway								
PAHs	UNITS										
Acenaphthylene	mg/kg	300	190	0.2 U	NA	0.2 U	NA	0.2 U	0.2 U	0.2 U	NA
Benzo(a)anthracene	mg/kg	12	10	**0.03**	NA	0.01 U	NA	0.01 U	**0.01**	**0.05**	NA
Benzo(a)pyrene	mg/kg	1.2	16	**0.03**	NA	0.01 U	NA	0.01 U	**0.02**	**0.05**	NA
Benzo(b)fluoranthene	mg/kg	12	19	**0.05**	NA	0.01 U	NA	0.01 U	**0.02**	**0.08**	NA
Benzo(g,h,i)perylene	mg/kg	--	--	**0.04**	NA	0.01 U	NA	0.01 U	**0.02**	**0.03**	NA
Benzo(k)fluoranthene	mg/kg	10	10	**0.01**	NA	0.01 U	NA	0.01 U	0.01 U	**0.02**	NA
Chrysene	mg/kg	6.4	6.4	**0.04 J**	NA	0.01 UJ	NA	0.01 U	**0.02**	**0.06**	NA
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	NA	0.01 U	NA	0.01 U	0.01 U	0.01 U	NA
Fluoranthene	mg/kg	220	220	**0.05**	NA	0.02 U	NA	0.02 U	**0.03**	**0.06**	NA
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	**0.01**	NA	0.01 U	NA	0.01 U	0.01 U	**0.02**	NA
Phenanthrene	mg/kg	--	--	0.19 R	NA	0.06 UR	NA	0.06 U	0.05 U	**0.2**	NA
Pyrene	mg/kg	140	140	**0.06 J**	NA	0.02 UJ	NA	0.02 U	**0.02**	**0.08**	NA
Volatiles	UNITS										
Acetone	ug/kg	1,700,000	1,100	110 UJ	280 U	120 UJ	300 U	110 U	110 U	120 UJ	6,000 U
cis-1,2-Dichloroethene	ug/kg	57,000	800	**23.3 J**	**19**	**9 J**	14 U	5.7 U	5.4 U	**17 J**	290 U
Tetrachloroethene	ug/kg	79,000	180	**OVERCAL**	**675**	**OVERCAL**	**465**	**37.4**	5.4 U	**OVERCAL**	**4,120 J**
trans-1,2-Dichloroethene	ug/kg	94,000	1,500	5.7 UJ	14 U	6 UJ	14 U	5.7 U	5.4 U	5.8 UJ	290 U
Trichloroethene	ug/kg	62,000	200	**29.9 J**	**30**	**18 J**	**15**	5.7 U	5.4 U	**81.4 J**	290 U

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold**.

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-4 (continued)
Building 367 Soil-Sampling Results
Locations B2350S - B2429S

354 Area Solvent Detections RI Report

Fort Riley, Kansas

Sample Point:				B2358S/SB02	B2358S/SB02	B2358S/SB03	B2358S/SB04	B2358S/SB11	B2358S/SB11	B2360S/SB01	B2360S/SB02
Date Sampled:				11/5/2001	11/5/2001	11/5/2001	11/5/2001	11/5/2001	11/5/2001	11/6/2001	11/6/2001
Sample Depth From:				1	1	4	7	7	7	0	1
Sample Depth To:				4	4	7	10	10	10	1	4
Laboratory Number:				01110299	01110299R Re-analysis	01110300	01110301	01110302 Duplicate	01110302R Re-analysis	01110566	01110567
		RSK Soil Pathway	RSK Soil to GW Pathway								
PAHs	UNITS										
Acenaphthylene	mg/kg	300	190	0.2 U	NA	0.2 U	0.2 U	0.2 UJ	0.2 UR	0.2 U	0.2 U
Benzo(a)anthracene	mg/kg	12	10	0.01 U	NA	0.01 U	0.01 U	0.01 UJ	0.01 UR	**0.13**	**0.02**
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	NA	0.01 U	0.01 U	0.01 UJ	0.01 UR	**0.12**	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	NA	0.01 U	0.01 U	0.01 UJ	0.01 UR	**0.15**	**0.02**
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	NA	0.01 U	0.01 U	0.01 UJ	0.01 UR	**0.08**	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	NA	0.01 U	0.01 U	0.01 UJ	0.01 UR	**0.06**	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U	NA	0.01 U	0.01 U	0.01 UJ	0.01 UR	**0.13**	**0.02**
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	NA	0.01 U	0.01 U	0.01 UJ	0.01 UR	**0.01**	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U	NA	0.02 U	0.02 U	0.02 UJ	0.02 UR	**0.27**	**0.02**
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	NA	0.01 U	0.01 U	0.01 UJ	0.01 UR	**0.08**	0.01 U
Phenanthrene	mg/kg	--	--	0.06 U	NA	0.06 U	0.06 U	0.06 UJ	0.06 UR	0.35 R	0.06 R
Pyrene	mg/kg	140	140	0.02 U	NA	0.02 U	0.02 U	0.02 UJ	0.02 UR	**0.24**	**0.03**
Volatiles	UNITS										
Acetone	ug/kg	1,700,000	1,100	120 UJ	6,000 U	120 U	120 U	120 U	NA	**220**	300 U
cis-1,2-Dichloroethene	ug/kg	57,000	800	**9.9 J**	290 U	6 UJ	**11 J**	**8.1 J**	NA	**262**	**555 J**
Tetrachloroethene	ug/kg	79,000	180	**OVERCAL**	**2,000 J**	**264 J**	**95.8 J**	**33.1 J**	NA	5.4 U	**608 J**
trans-1,2-Dichloroethene	ug/kg	94,000	1,500	5.8 UJ	290 U	6 U	5.8 U	5.9 U	NA	**6.4**	14 U
Trichloroethene	ug/kg	62,000	200	**31.1 J**	290 U	6 UJ	5.8 UJ	5.9 UJ	NA	5.4 U	**59**

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-4 (continued)
Building 367 Soil-Sampling Results
Locations B2350S - B2429S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B2360S/SB03	B2360S/SB03	B2360S/SB04	B2369S/SB01	B2369S/SB01	B2369S/SB02	B2369S/SB02	B2369S/SB02R
			Date Sampled:	11/6/2001	11/6/2001	11/6/2001	11/1/2001	11/1/2001	11/1/2001	11/1/2001	10/23/2002
			Sample Depth From:	4	4	7	0	0	1	1	1
			Sample Depth To:	7	7	10	1	1	4	4	4
			Laboratory Number:	01110568	01110568R Re-analysis	01110569	01110163	01110163R Re-analysis	01110164	01110164R Re-analysis	02102102 Re-sampling
		RSK Soil Pathway	RSK Soil to GW Pathway								
PAHs	UNITS										
Acenaphthylene	mg/kg	300	190	0.2 U	NA	0.2 U	0.2 U	NA	0.2 U	NA	NA
Benzo(a)anthracene	mg/kg	12	10	0.01 U	NA	0.01 U	0.01 U	NA	**0.01**	NA	NA
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	NA	0.01 U	0.01 U	NA	**0.01**	NA	NA
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	NA	0.01 U	0.01 U	NA	**0.02**	NA	NA
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	NA	0.01 U	0.01 U	NA	**0.01**	NA	NA
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	NA	0.01 U	0.01 U	NA	0.01 U	NA	NA
Chrysene	mg/kg	6.4	6.4	0.01 U	NA	0.01 U	0.01 U	NA	**0.01**	NA	NA
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	NA	0.01 U	0.01 U	NA	0.01 U	NA	NA
Fluoranthene	mg/kg	220	220	0.02 U	NA	0.02 U	0.02 U	NA	0.02 U	NA	NA
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	NA	0.01 U	0.01 U	NA	0.01 U	NA	NA
Phenanthrene	mg/kg	--	--	0.06 UR	NA	0.06 UR	0.06 U	NA	0.06 U	NA	NA
Pyrene	mg/kg	140	140	0.02 U	NA	0.02 U	0.02 U	NA	0.02 U	NA	NA
Volatiles	UNITS										
Acetone	ug/kg	1,700,000	1,100	300 UJ	300 UR	110 U	120 UJ	300 U	120 UJ	6,000 UR	NA
cis-1,2-Dichloroethene	ug/kg	57,000	800	**436 J**	364 R	**68.2**	6.1 UJ	14 UJ	6.1 UJ	300 UR	NA
Tetrachloroethene	ug/kg	79,000	180	**222 J**	200 R	**29.2**	**OVERCAL**	**572 J**	**OVERCAL**	1,890 R	**5,160**
trans-1,2-Dichloroethene	ug/kg	94,000	1,500	14 UJ	14 UR	5.6 U	6.1 UJ	14 U	6.1 UJ	300 UR	NA
Trichloroethene	ug/kg	62,000	200	**23 J**	20 R	5.6 U	6.1 UJ	14 UJ	**7.3 J**	300 UR	NA

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-4 (continued)
Building 367 Soil-Sampling Results
Locations B2350S - B2429S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B2369S/SB03	B2369S/SB04	B2370S/SB01	B2370S/SB01	B2370S/SB02	B2370S/SB02	B2370S/SB11	B2370S/SB11
			Date Sampled:	11/1/2001	11/1/2001	11/6/2001	11/6/2001	11/6/2001	11/6/2001	11/6/2001	11/6/2001
			Sample Depth From:	4	7	0	0	1	1	1	1
			Sample Depth To:	7	10	1	1	4	4	4	4
			Laboratory Number:	01110165	01110166	01110560	01110560R Re-analysis	01110561	01110561R Re-analysis	01110564 Duplicate	01110564R Re-analysis
		RSK Soil Pathway	RSK Soil to GW Pathway								
PAHs	UNITS										
Acenaphthylene	mg/kg	300	190	0.2 U	0.2 U	0.2 U	**0.2**	0.2 U	NA	0.2 U	NA
Benzo(a)anthracene	mg/kg	12	10	0.01 U	0.01 U	**0.07**	**0.04**	**0.04**	NA	**0.05**	NA
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	0.01 U	**0.06**	**0.04**	**0.05**	NA	**0.07**	NA
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	0.01 U	**0.1**	**0.05**	**0.06**	NA	**0.08**	NA
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	0.01 U	**0.07**	**0.05**	**0.05**	NA	**0.08**	NA
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	NA	0.01 U	NA
Chrysene	mg/kg	6.4	6.4	0.01 U	0.01 U	**0.09**	**0.04**	**0.04**	NA	**0.06**	NA
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	0.01 U	0.01 U	**0.01**	**0.01**	NA	**0.03**	NA
Fluoranthene	mg/kg	220	220	0.02 U	0.02 U	**0.04**	**0.02**	**0.03**	NA	**0.02**	NA
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	NA	0.01 U	NA
Phenanthrene	mg/kg	--	--	0.06 U	0.06 U	0.26 R	0.12 R	**0.09**	NA	0.13 R	NA
Pyrene	mg/kg	140	140	0.02 U	0.02 U	**0.08**	**0.05**	**0.04**	NA	**0.05**	NA
Volatiles	UNITS										
Acetone	ug/kg	1,700,000	1,100	120 U	120 U	280 U	NA	110 U	5,500 UR	110 UJ	5,500 UR
cis-1,2-Dichloroethene	ug/kg	57,000	800	6.1 U	5.8 U	**35**	NA	**51.8**	280 UR	**65.2 J**	280 UR
Tetrachloroethene	ug/kg	79,000	180	**138 J**	**41.8**	**408**	NA	**OVERCAL**	**3,110 R**	**OVERCAL**	4,470 R
trans-1,2-Dichloroethene	ug/kg	94,000	1,500	6.1 U	5.8 U	13 U	NA	5.6 U	280 UR	5.5 UJ	280 UR
Trichloroethene	ug/kg	62,000	200	6.1 U	5.8 U	**21**	NA	**50.2**	280 UR	**49.7 J**	280 UR

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold**.

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-4 (continued)
Building 367 Soil-Sampling Results
Locations B2350S - B2429S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B2370S/SB02R	B2370S/SB03	B2370S/SB04	B2429S/SB01	B2429S/SB01	B2429S/SB02	B2429S/SB03	B2429S/SB04
			Date Sampled:	10/23/2002	11/6/2001	11/6/2001	11/9/2001	11/9/2001	11/9/2001	11/9/2001	11/9/2001
			Sample Depth From:	1	4	7	0	0	1	4	7
			Sample Depth To:	4	7	10	1	1	4	7	10
			Laboratory Number:	02102101 Re-sampling	01110562	01110563	01110891	01110891R Re-analysis	01110892	01110893	01110894
		RSK Soil Pathway	RSK Soil to GW Pathway								
PAHs	UNITS										
Acenaphthylene	mg/kg	300	190	NA	0.2 U	0.2 U	0.2 UJ	0.2 UR	0.2 U	0.2 U	0.2 U
Benzo(a)anthracene	mg/kg	12	10	NA	0.01 U	0.01 U	0.01 UJ	0.03 R	0.01 U	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	NA	0.01 U	0.01 U	**0.01 J**	0.03 R	0.01 U	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	NA	0.01 U	0.01 U	**0.01 J**	0.04 R	0.01 U	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	NA	0.01 U	0.01 U	**0.01 J**	0.03 R	0.01 U	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	NA	0.01 U	0.01 U	0.01 UJ	0.02 R	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	NA	0.01 U	0.01 U	**0.01 J**	0.04 R	0.01 U	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	NA	0.01 U	0.01 U	0.01 UJ	0.01 UR	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	NA	0.02 U	0.02 U	0.02 UJ	0.05 R	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	NA	0.01 U	0.01 U	0.01 UJ	0.02 R	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	--	--	NA	0.06 UR	0.06 UR	0.05 UJ	0.07 R	0.06 UR	0.05 U	0.05 U
Pyrene	mg/kg	140	140	NA	0.02 U	0.02 U	0.02 UJ	0.05 R	0.02 U	0.02 U	0.02 U
Volatiles	UNITS										
Acetone	ug/kg	1,700,000	1,100	NA	120 U	110 U	110 UJ	110 U	110 U	110 U	100 U
cis-1,2-Dichloroethene	ug/kg	57,000	800	NA	**33.1**	**8.3**	5.4 UJ	5.4 U	5.6 U	5.3 U	5.1 U
Tetrachloroethene	ug/kg	79,000	180	**2,050**	**290**	**22**	**31.3 J**	**28.7**	**7.8**	5.3 U	5.1 U
trans-1,2-Dichloroethene	ug/kg	94,000	1,500	NA	6 U	5.6 U	5.4 UJ	5.4 U	5.6 U	5.3 U	5.1 U
Trichloroethene	ug/kg	62,000	200	NA	**10**	5.6 U	5.4 UJ	5.4 U	5.6 U	5.3 U	5.1 U

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   ▨ Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-5
Building 354/332/DPW Compound Soil-Sampling Results
Locations B150 - B165
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Point:				B150/SB01	B150/SB01	B150/SB02	B150/SB11	B150/SB11	B150/SB03
Date Sampled:				10/29/2001	10/29/2001	10/29/2001	10/29/2001	10/29/2001	10/29/2001
Sample Depth From:				0	0	1	1	3	4
Sample Depth To:				1	1	4	4	4	7
Laboratory Number:				01103080	01103080R Reanalysis	01103081	01103084 Duplicate	01103084R Re-analysis	01103082
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Benzo(a)anthracene	mg/kg	12	10	0.01 U	NA	0.01 U	0.01 U	NA	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	NA	0.01 U	0.01 U	NA	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	NA	0.01 U	0.01 U	NA	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	NA	0.01 U	0.01 U	NA	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	NA	0.01 U	0.01 U	NA	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U	NA	0.01 U	0.01 U	NA	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	NA	0.01 U	0.01 U	NA	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U	NA	0.02 U	0.02 U	NA	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	NA	0.01 U	0.01 U	NA	0.01 U
Phenanthrene	mg/kg	--	--	0.05 U	NA	0.06 U	0.06 U	NA	0.05 U
Pyrene	mg/kg	140	140	0.02 U	NA	0.02 U	0.02 U	NA	0.02 U
Volatiles	UNITS								
Tetrachloroethene	ug/kg	79,000	180	5.5 UJ	5.5 UR	5.6 U	5.5 U	5.5 U	5.3 U

Notes:
1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-5 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B150 - B165

354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B150/SB04	B151/SB11	B151/SB02	B151/SB03	B151/SB04	B152/SB01
			Date Sampled:	10/29/2001	10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/30/2001
			Sample Depth From:	7	0	1	4	7	0
			Sample Depth To:	10	1	4	7	10	1
			Laboratory Number:	01103083	01102228	01102229	01102230	01102231	01103187
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	**UNITS**								
Benzo(a)anthracene	mg/kg	12	10	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	--	--	0.05 U	0.06 U	0.06 U	0.06 U	0.05 U	0.06 U
Pyrene	mg/kg	140	140	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Volatiles	**UNITS**								
Tetrachloroethene	ug/kg	79,000	180	5.2 U	5.6 U	5.6 U	5.5 U	5.2 U	**7.5**

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-5 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B150 - B165
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Point:				B152/SB02	B152/SB03	B152/SB04	B152/SB04	B153/SB01	B153/SB02
Date Sampled:				10/30/2001	10/30/2001	10/30/2001	10/30/2001	10/26/2001	10/26/2001
Sample Depth From:				1	4	7	7	0	1
Sample Depth To:				4	7	10	10	1	4
Laboratory Number:				01103188	01103189	01103190	01103191 Duplicate	01102897	01102898
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Benzo(a)anthracene	mg/kg	12	10	**0.01**	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	**0.02**	0.01 U	0.01 U	0.01 U	**0.03**	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	**0.02**	0.01 U	0.01 U	0.01 U	**0.03**	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	**0.03**	0.02 U	0.02 U	0.02 U	**0.04**	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	--	--	**0.06**	0.06 U	0.05 U	0.05 U	**0.18**	0.05 U
Pyrene	mg/kg	140	140	**0.03**	0.02 U	0.02 U	0.02 U	**0.05**	0.02 U
Volatiles	UNITS								
Tetrachloroethene	ug/kg	79,000	180	5.7 U	5.6 U	5.3 U	5.3 U	5.6 U	5.4 U

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-5 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B150 - B165
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B153/SB03	B153/SB04	B154/SB01	B154/SB02	B154/SB03	B154/SB04
			Date Sampled:	10/26/2001	10/26/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001
			Sample Depth From:	4	7	0	1	4	7
			Sample Depth To:	7	10	1	4	7	10
			Laboratory Number:	01102899	01102900	01102424	01102425	01102426	01102427
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	**UNITS**								
Benzo(a)anthracene	mg/kg	12	10	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U	0.02 U	**0.03**	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	--	--	0.05 U	0.05 U	**0.06**	0.06 U	0.06 U	0.05 U
Pyrene	mg/kg	140	140	0.02 U	0.02 U	**0.03**	0.02 U	0.02 U	0.02 U
Volatiles	**UNITS**								
Tetrachloroethene	ug/kg	79,000	180	5.4 U	5.3 U	5.5 U	5.5 U	5.6 U	5.4 U

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-5 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B150 - B165
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B155/SB01	B155/SB01	B155/SB02	B155/SB11	B155/SB03	B155/SB04
			Date Sampled:	10/30/2001	10/30/2001	10/30/2001	10/30/2001	10/30/2001	10/30/2001
			Sample Depth From:	0	0	1	1	4	7
			Sample Depth To:	1	1	4	4	7	10
			Laboratory Number:	01103192	01103192R	01103193	01103196 Duplicate	01103194	01103195
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	**UNITS**								
Benzo(a)anthracene	mg/kg	12	10	**0.04**	NA	**0.02**	0.01 U	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	**0.03**	NA	**0.02**	0.01 U	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	**0.04**	NA	**0.02**	**0.01**	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	**0.02**	NA	**0.01**	0.01 U	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	**0.02**	NA	0.01 U	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	**0.04**	NA	**0.02**	0.01 U	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	NA	0.01 U	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	**0.08**	NA	**0.04**	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	**0.02**	NA	**0.01**	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	--	--	**0.08**	NA	0.06 U	0.06 U	0.06 U	0.05 U
Pyrene	mg/kg	140	140	**0.07**	NA	**0.04**	0.02 U	0.02 U	0.02 U
Volatiles	**UNITS**								
Tetrachloroethene	ug/kg	79,000	180	5.4 UR	5.4 UR	5.5 U	5.5 U	5.6 U	5.3 U

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-5 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B150 - B165

354 Area Solvent Detections RI Report

Fort Riley, Kansas

			Sample Point:	B156/SB01	B156/SB01	B156/SB02	B156/SB03	B156/SB04	B157/SB01
			Date Sampled:	10/26/2001	10/26/2001	10/26/2001	10/26/2001	10/26/2001	10/30/2001
			Sample Depth From:	0	0	1	4	7	0
			Sample Depth To:	1	1	4	7	10	1
			Laboratory Number:	01102901	01102901R	01102902	01102903	01102904	01103180
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Benzo(a)anthracene	mg/kg	12	10	0.01 U	NA	0.01 U	0.01 U	0.01 U	**0.02**
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	NA	0.01 U	0.01 U	0.01 U	**0.02**
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	NA	0.01 U	0.01 U	0.01 U	**0.04**
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	NA	0.01 U	0.01 U	0.01 U	**0.03**
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	NA	0.01 U	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U	NA	0.01 U	0.01 U	0.01 U	**0.03**
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	NA	0.01 U	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U	NA	0.02 U	0.02 U	0.02 U	**0.04**
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	NA	0.01 U	0.01 U	0.01 U	**0.01**
Phenanthrene	mg/kg	--	--	0.06 U	NA	0.06 U	0.06 U	0.05 U	**0.13**
Pyrene	mg/kg	140	140	0.02 U	NA	0.02 U	0.02 U	0.02 U	**0.05**
Volatiles	UNITS								
Tetrachloroethene	ug/kg	79,000	180	5.6 UJ	5.6 UR	5.5 U	5.6 U	5.4 U	5.4 UJ

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available

mg/kg - milligrams per kilogram

ug/kg - micrograms per kilogram

J - Qualified as estimated

NA - Not Analysed

OVERCAL - Concentration exceeded calibration of instrument

PAH - Polycyclic Aromatic Hydrocarbon

R - Rejected

U - Compound was not detected

Table 5-5 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B150 - B165
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B157/SB01	B157/SB02	B157/SB02	B157/SB03	B157/SB03	B157/SB04
			Date Sampled:	10/30/2001	10/30/2001	10/30/2001	10/30/2001	10/30/2001	10/30/2001
			Sample Depth From:	0	1	1	4	4	7
			Sample Depth To:	1	4	4	7	7	10
			Laboratory Number:	01103180R	01103181	01103181R Re-analysis	01103182	01103182R Re-analysis	01103183
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Benzo(a)anthracene	mg/kg	12	10	NA	**0.02**	NA	0.01 U	NA	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	NA	**0.02**	NA	0.01 U	NA	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	NA	**0.04**	NA	0.01 U	NA	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	NA	**0.03**	NA	0.01 U	NA	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	NA	0.01 U	NA	0.01 U	NA	0.01 U
Chrysene	mg/kg	6.4	6.4	NA	**0.03**	NA	0.01 U	NA	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	NA	0.01 U	NA	0.01 U	NA	0.01 U
Fluoranthene	mg/kg	220	220	NA	**0.04**	NA	0.02 U	NA	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	NA	**0.01**	NA	0.01 U	NA	0.01 U
Phenanthrene	mg/kg	--	--	NA	**0.14**	NA	0.06 U	NA	0.06 U
Pyrene	mg/kg	140	140	NA	**0.04**	NA	0.02 U	NA	0.02 U
Volatiles	UNITS								
Tetrachloroethene	ug/kg	79,000	180	5.4 UJ	5.6 UJ	5.6 UR	5.6 UJ	5.6 U	5.6 U

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-5 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B150 - B165

354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B157/SB11	B158/SB01	B158/SB01	B158/SB02	B158/SB03	B158/SB04
			Date Sampled:	10/30/2001	10/26/2001	10/26/2001	10/26/2001	10/26/2001	10/26/2001
			Sample Depth From:	7	0	0	1	4	7
			Sample Depth To:	10	1	1	4	7	10
			Laboratory Number:	01103184 Duplicate	01102905	01102905R Re-analysis	01102906	01102907	01102908
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Benzo(a)anthracene	mg/kg	12	10	0.01 U	**0.03**	NA	0.01 U	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	**0.03**	NA	0.01 U	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	**0.05**	NA	0.01 U	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	**0.06**	NA	0.01 U	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	0.01 U	NA	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U	**0.05**	NA	0.01 U	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	0.01 U	NA	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U	**0.05**	NA	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	0.01 U	NA	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	--	--	0.06 U	**0.22**	NA	0.06 U	0.06 U	0.06 U
Pyrene	mg/kg	140	140	0.02 U	**0.07**	NA	0.02 U	0.02 U	0.02 U
Volatiles	UNITS								
Tetrachloroethene	ug/kg	79,000	180	5.5 U	5.4 UJ	5.4 UJ	5.6 U	5.6 U	5.6 U

Notes:
1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-5 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B150 - B165
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B159/SB01	B159/SB02	B159/SB03	B159/SB04	B160/SB01	B160/SB02
			Date Sampled:	10/25/2001	10/25/2001	10/25/2001	10/25/2001	10/29/2001	10/29/2001
			Sample Depth From:	0	1	4	7	0	1
			Sample Depth To:	1	4	7	10	1	4
			Laboratory Number:	01102854	01102855	01102856	01102857	01103085	01103086
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Benzo(a)anthracene	mg/kg	12	10	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	--	--	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
Pyrene	mg/kg	140	140	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Volatiles	UNITS								
Tetrachloroethene	ug/kg	79,000	180	5.7 U	5.9 U	5.9 U	5.8 U	5.7 U	5.6 U

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-5 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B150 - B165
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B160/SB02	B160/SB11	B160/SB11	B160/SB03	B160/SB03	B160/SB04
			Date Sampled:	10/29/2001	10/29/2001	10/29/2001	10/29/2001	10/29/2001	10/29/2001
			Sample Depth From:	1	1	1	4	4	7
			Sample Depth To:	4	4	4	7	7	10
			Laboratory Number:	01103086R Re-analysis	01103089 Duplicate	01103089R Re-analysis	01103087	01103087R Re-analysis	01103088
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	**UNITS**								
Benzo(a)anthracene	mg/kg	12	10	NA	0.01 U	NA	0.01 U	NA	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	NA	0.01 U	NA	0.01 U	NA	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	NA	0.01 U	NA	0.01 U	NA	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	NA	0.01 U	NA	0.01 U	NA	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	NA	0.01 U	NA	0.01 U	NA	0.01 U
Chrysene	mg/kg	6.4	6.4	NA	0.01 U	NA	0.01 U	NA	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	NA	0.01 U	NA	0.01 U	NA	0.01 U
Fluoranthene	mg/kg	220	220	NA	0.02 U	NA	0.02 U	NA	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	NA	0.01 U	NA	0.01 U	NA	0.01 U
Phenanthrene	mg/kg	--	--	NA	0.06 U	NA	0.06 U	NA	0.05 U
Pyrene	mg/kg	140	140	NA	0.02 U	NA	0.02 U	NA	0.02 U
Volatiles	**UNITS**								
Tetrachloroethene	ug/kg	79,000	180	5.6 U	5.6 U	5.6 U	5.7 U	5.7 U	5.4 U

Notes:
1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-5 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B150 - B165
354 Area Solvent Detections RI Report
Fort Riley, Kansas

				B160/SB04	B161/SB01	B161/SB02	B161/SB03	B161/SB04	B162/SB01
Sample Point:				B160/SB04	B161/SB01	B161/SB02	B161/SB03	B161/SB04	B162/SB01
Date Sampled:				10/29/2001	10/26/2001	10/26/2001	10/26/2001	10/26/2001	10/30/2001
Sample Depth From:				7	0	1	4	7	0
Sample Depth To:				10	1	4	7	10	1
Laboratory Number:				01103088R Re-analysis	01102893	01102894	01102895	01102896	01103175
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Benzo(a)anthracene	mg/kg	12	10	NA	**0.02**	**0.05**	0.01 U	0.01 U	0.01 UJ
Benzo(a)pyrene	mg/kg	1.2	16	NA	**0.02**	**0.04**	0.01 U	0.01 U	0.01 UJ
Benzo(b)fluoranthene	mg/kg	12	19	NA	**0.03**	**0.05**	0.01 U	0.01 U	0.01 UJ
Benzo(g,h,i)perylene	mg/kg	--	--	NA	**0.04**	**0.06**	0.01 U	0.01 U	0.01 UJ
Benzo(k)fluoranthene	mg/kg	10	10	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ
Chrysene	mg/kg	6.4	6.4	NA	**0.03**	**0.07**	0.01 U	0.01 U	0.01 UJ
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ
Fluoranthene	mg/kg	220	220	NA	0.02 U	**0.03**	0.02 U	0.02 U	0.02 UJ
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ
Phenanthrene	mg/kg	--	--	NA	**0.07**	**0.13**	0.06 U	0.06 U	0.05 UJ
Pyrene	mg/kg	140	140	NA	**0.04**	**0.07**	0.02 U	0.02 U	0.02 UJ
Volatiles	UNITS								
Tetrachloroethene	ug/kg	79,000	180	5.4 U	5.6 U	5.6 U	5.6 U	5.5 U	5.3 U

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-5 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B150 - B165
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B162/SB01	B162/SB02	B162/SB03	B162/SB03	B162/SB04	B162/SB04
			Date Sampled:	10/30/2001	10/30/2001	10/30/2001	10/30/2001	10/30/2001	10/30/2001
			Sample Depth From:	0	1	4	4	7	7
			Sample Depth To:	1	4	7	7	10	10
			Laboratory Number:	01103175R Re-analysis	01103176	01103177	01103177R Re-analysis	01103178	01103178R Re-analysis
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	**UNITS**								
Benzo(a)anthracene	mg/kg	12	10	0.01 U	0.01 U	0.01 U	NA	0.01 U	NA
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	0.01 U	0.01 U	NA	0.01 U	NA
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	0.01 U	0.01 U	NA	0.01 U	NA
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	0.01 U	0.01 U	NA	0.01 U	NA
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	0.01 U	0.01 U	NA	0.01 U	NA
Chrysene	mg/kg	6.4	6.4	0.01 U	0.01 U	0.01 U	NA	0.01 U	NA
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	0.01 U	0.01 U	NA	0.01 U	NA
Fluoranthene	mg/kg	220	220	0.02 U	0.02 U	0.02 U	NA	0.02 U	NA
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	0.01 U	0.01 U	NA	0.01 U	NA
Phenanthrene	mg/kg	--	--	0.05 U	0.06 U	0.06 U	NA	0.06 U	NA
Pyrene	mg/kg	140	140	0.02 U	0.02 U	0.02 U	NA	0.02 U	NA
Volatiles	**UNITS**								
Tetrachloroethene	ug/kg	79,000	180	NA	5.8 U	5.6 U	5.6 UJ	5.9 U	5.9 UJ

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-5 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B150 - B165
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Point:				B163/SB01	B163/SB02	B163/SB02	B163/SB03	B163/SB04	B164/SB01
Date Sampled:				10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/22/2001
Sample Depth From:				0	1	1	4	7	0
Sample Depth To:				1	4	4	7	10	1
Laboratory Number:				01102224	01102225	01102225R Re-analysis	01102226	01102227	01102098
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Benzo(a)anthracene	mg/kg	12	10	**0.4**	0.01 U	NA	0.01 U	0.01 U	**0.08**
Benzo(a)pyrene	mg/kg	1.2	16	**0.2**	0.01 U	NA	0.01 U	0.01 U	**0.08**
Benzo(b)fluoranthene	mg/kg	12	19	**0.4**	**0.01**	NA	0.01 U	0.01 U	**0.09**
Benzo(g,h,i)perylene	mg/kg	--	--	**0.2**	**0.02**	NA	0.01 U	0.01 U	**0.07**
Benzo(k)fluoranthene	mg/kg	10	10	**0.2**	0.01 U	NA	0.01 U	0.01 U	**0.04**
Chrysene	mg/kg	6.4	6.4	**0.4**	0.01 U	NA	0.01 U	0.01 U	**0.08**
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	**0.08**	0.01 U	NA	0.01 U	0.01 U	0.02 U
Fluoranthene	mg/kg	220	220	**0.94**	0.02 U	NA	0.02 U	0.02 U	**0.2**
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	**0.2**	0.01 U	NA	0.01 U	0.01 U	**0.05**
Phenanthrene	mg/kg	--	--	**0.71**	0.06 U	NA	0.06 U	0.06 U	0.1 U
Pyrene	mg/kg	140	140	**0.77**	0.02 U	NA	0.02 U	0.02 U	**0.1**
Volatiles	UNITS								
Tetrachloroethene	ug/kg	79,000	180	5.6 U	5.6 UJ	5.6 UJ	5.6 U	5.7 U	5.7 U

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-5 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B150 - B165
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B164/SB02	B164/SB03	B164/SB03	B164/SB04	B164/SB05	B165/SB01
			Date Sampled:	10/22/2001	10/22/2001	10/22/2001	10/22/2001	10/22/2001	10/22/2001
			Sample Depth From:	1	4	4	7	17	0
			Sample Depth To:	4	7	7	10	18	1
			Laboratory Number:	01102099	01102100	01102100R Re-analysis	01102101	01102102	01102091
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Benzo(a)anthracene	mg/kg	12	10	**0.04**	**0.02**	NA	0.01 U	0.01 U	**1**
Benzo(a)pyrene	mg/kg	1.2	16	**0.04**	**0.02**	NA	**0.01**	0.01 U	**1**
Benzo(b)fluoranthene	mg/kg	12	19	**0.05**	**0.03**	NA	**0.01**	0.01 U	**1**
Benzo(g,h,i)perylene	mg/kg	--	--	**0.04**	**0.04**	NA	**0.01**	0.01 U	**0.5**
Benzo(k)fluoranthene	mg/kg	10	10	**0.02**	0.01 U	NA	0.01 U	0.01 U	**0.5**
Chrysene	mg/kg	6.4	6.4	**0.04**	**0.02**	NA	0.01 U	0.01 U	**1**
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	**0.01**	NA	0.01 U	0.01 U	0.2 U
Fluoranthene	mg/kg	220	220	**0.1**	**0.05**	NA	0.02 U	0.02 U	**2.5**
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	**0.03**	**0.02**	NA	0.01 U	0.01 U	**0.6**
Phenanthrene	mg/kg	--	--	**0.06**	0.05 U	NA	0.05 U	0.06 U	**2**
Pyrene	mg/kg	140	140	**0.08**	**0.04**	NA	0.02 U	0.02 U	**2**
Volatiles	UNITS								
Tetrachloroethene	ug/kg	79,000	180	5.6 U	5.4 U	5.4 UJ	5.5 U	5.8 U	5.7 U

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-5 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B150 - B165
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B165/SB02	B165/SB03	B165/SB04	B165/SB11	B165/SB05	B165/SB06
			Date Sampled:	10/22/2001	10/22/2001	10/22/2001	10/22/2001	10/22/2001	10/22/2001
			Sample Depth From:	1	4	7	7	12	16
			Sample Depth To:	4	7	10	10	14	18
			Laboratory Number:	01102092	01102093	01102094	01102097	01102095	01102096
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Benzo(a)anthracene	mg/kg	12	10	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA
Chrysene	mg/kg	6.4	6.4	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA
Fluoranthene	mg/kg	220	220	0.02 U	0.02 U	0.02 U	0.02 U	NA	NA
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA
Phenanthrene	mg/kg	--	--	0.06 U	0.05 U	0.05 U	0.05 U	NA	NA
Pyrene	mg/kg	140	140	0.02 U	0.02 U	0.02 U	0.02 U	NA	NA
Volatiles	UNITS								
Tetrachloroethene	ug/kg	79,000	180	5.5 U	5.3 U	5.2 U	5.3 U	5.6 U	5.5 U

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-6
Building 354/332/DPW Compound Soil-Sampling Results
Locations B166 - B173
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Point:				B166/SB01	B166/SB02	B166/SB03	B166/SB03	B166/SB04	B167/SB01
Date Sampled:				10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/23/2001
Sample Depth From:				0	1	4	4	7	0
Sample Depth To:				1	4	7	7	10	1
Laboratory Number:				01102418	01102419	01102420	01102420R Re-analysis	01102421	01102218
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	**UNITS**								
Anthracene	mg/kg	13	13	0.06 U	0.05 U	0.05 U	0.05 UR	0.05 U	0.6 U
Benzo(a)anthracene	mg/kg	12	10	0.01 U	0.01 U	0.01 U	0.01 UR	0.01 U	**1**
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	0.01 U	0.01 U	0.01 UR	0.01 U	**0.8**
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	0.01 U	0.01 U	0.01 UR	0.01 U	**0.9**
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	0.01 U	**0.02 J**	0.02 R	0.01 U	**0.4**
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	0.01 U	0.01 U	0.01 UR	0.01 U	**0.4**
Chrysene	mg/kg	6.4	6.4	0.01 U	0.01 U	0.01 U	0.01 UR	0.01 U	**0.9**
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	0.01 U	**0.01 J**	0.01 UR	0.01 U	**0.1**
Fluoranthene	mg/kg	220	220	0.02 U	0.02 U	0.02 U	0.02 UR	0.02 U	**2.3**
Fluorene	mg/kg	270	200	0.02 U	0.02 U	0.02 U	0.02 UR	0.02 U	**0.2**
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	0.01 U	0.01 U	0.01 UR	0.01 U	**0.4**
Naphthalene	mg/kg	100	39	0.1 U	0.1 U	0.1 U	0.1 UR	0.1 U	1 U
Phenanthrene	mg/kg	--	--	0.06 U	0.05 U	0.05 U	0.05 UR	0.05 U	**2.2**
Pyrene	mg/kg	140	140	0.02 U	0.02 U	0.02 U	0.02 UR	0.02 U	**1.6**
Volatiles	**UNITS**								
Benzene	ug/kg	9,800	80	5.5 U	5.4 U	5.3 U	NA	5.3 U	5.8 UJ
Ethylbenzene	ug/kg	650,000	55,000	5.5 U	5.4 U	5.3 U	NA	5.3 U	5.8 UJ
m,p-Xylene	ug/kg	700,000	700,000	5.5 U	5.4 U	5.3 U	NA	5.3 U	5.8 UJ
o-Xylene	ug/kg	700,000	700,000	11 U	11 U	10 U	NA	11 U	12 UJ
Toluene	ug/kg	930,000	40,000	5.5 U	5.4 U	5.3 U	NA	5.3 U	5.8 UJ

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold**.

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-6 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B166 - B173
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Point:				B167/SB01	B167/SB02	B167/SB03	B167/SB04	B167/SB11	B167/SB05
Date Sampled:				10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/23/2001
Sample Depth From:				0	1	4	7	7	11
Sample Depth To:				1	4	7	10	10	12
Laboratory Number:				01102218R Re-analysis	01102219	01102220	01102221	01102222 Duplicate	01102223
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Anthracene	mg/kg	13	13	NA	**0.3**	0.06 U	0.05 U	0.05 U	0.05 U
Benzo(a)anthracene	mg/kg	12	10	NA	**0.63**	0.01 U	0.01 U	**0.04**	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	NA	**0.46**	0.01 U	0.01 U	**0.04**	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	NA	**0.54**	0.01 U	0.01 U	**0.04**	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	NA	**0.45**	0.01 U	0.01 U	**0.02**	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	NA	**0.2**	0.01 U	0.01 U	**0.02**	0.01 U
Chrysene	mg/kg	6.4	6.4	NA	**0.62**	0.01 U	0.01 U	**0.04**	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	NA	**0.1**	0.01 U	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	NA	**1.2**	0.02 U	0.02 U	**0.09**	0.02 U
Fluorene	mg/kg	270	200	NA	**0.1**	0.02 U	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	NA	**0.3**	0.01 U	0.01 U	**0.02**	0.01 U
Naphthalene	mg/kg	100	39	NA	0.4 U	0.1 U	0.1 U	0.1 U	0.1 U
Phenanthrene	mg/kg	--	--	NA	**1.2**	0.06 U	0.05 U	**0.11**	0.05 U
Pyrene	mg/kg	140	140	NA	**1**	0.02 U	0.02 U	**0.08**	0.02 U
Volatiles	UNITS								
Benzene	ug/kg	9,800	80	5.8 UJ	5.6 U	5.7 U	5.3 U	5.3 U	5.4 U
Ethylbenzene	ug/kg	650,000	55,000	5.8 UJ	5.6 U	5.7 U	5.3 U	5.3 U	5.4 U
m,p-Xylene	ug/kg	700,000	700,000	5.8 UJ	5.6 U	5.7 U	5.3 U	5.3 U	5.4 U
o-Xylene	ug/kg	700,000	700,000	12 UJ	11 U	11 U	10 U	10 U	11 U
Toluene	ug/kg	930,000	40,000	5.8 UJ	5.6 U	5.7 U	5.3 U	5.3 U	5.4 U

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold**.

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-6 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B166 - B173

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Point:				B168/SB01	B168/SB02	B168/SB03	B168/SB04	B169/SB01	B169/SB02
Date Sampled:				10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/24/2001	10/24/2001
Sample Depth From:				0	1	4	4	0	1
Sample Depth To:				1	4	7	7	1	4
Laboratory Number:				01102214	01102215	01102216	01102217	01102412	01102413
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Anthracene	mg/kg	13	13	0.6 U	0.06 U	0.05 U	0.05 U	0.06 U	0.06 U
Benzo(a)anthracene	mg/kg	12	10	0.1 U	**0.05**	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	**0.25**	**0.06**	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	**0.1**	**0.08**	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	**0.56**	**0.1**	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.1 U	**0.01**	0.01 U	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	0.1 U	**0.05**	0.01 U	0.01 U	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.1 U	**0.02**	0.01 U	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	0.2 U	**0.06**	0.02 U	0.02 U	0.02 U	0.02 U
Fluorene	mg/kg	270	200	0.2 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Naphthalene	mg/kg	100	39	1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Phenanthrene	mg/kg	--	--	0.6 U	**0.06**	0.05 U	0.05 U	0.06 U	0.06 U
Pyrene	mg/kg	140	140	0.2 U	**0.09**	0.02 U	0.02 U	0.02 U	0.02 U
Volatiles	UNITS								
Benzene	ug/kg	9,800	80	5.7 U	5.6 U	5.2 U	5.4 U	5.6 U	5.5 U
Ethylbenzene	ug/kg	650,000	55,000	5.7 U	5.6 U	5.2 U	5.4 U	5.6 U	5.5 U
m,p-Xylene	ug/kg	700,000	700,000	5.7 U	5.6 U	5.2 U	5.4 U	5.6 U	5.5 U
o-Xylene	ug/kg	700,000	700,000	11 U	11 U	10 U	11 U	11 U	11 U
Toluene	ug/kg	930,000	40,000	5.7 U	5.6 U	5.2 U	5.4 U	5.6 U	5.5 U

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-6 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B166 - B173
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B169/SB03	B169/SB04	B169/SB05	B169/SB06	B170/SB01	B170/SB01
			Date Sampled:	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001
			Sample Depth From:	4	7	25	28	0	0
			Sample Depth To:	7	10	25.5	28.5	1	1
			Laboratory Number:	01102414	01102415	01102416	01102417	01102407	01102407R Re-analysis
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Anthracene	mg/kg	13	13	0.05 U	0.05 U	0.06 U	0.05 U	0.06 U	NA
Benzo(a)anthracene	mg/kg	12	10	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	NA
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	NA
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	NA
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	0.01 U	0.01 U	0.01 U	**0.04**	NA
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	NA
Chrysene	mg/kg	6.4	6.4	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	NA
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	NA
Fluoranthene	mg/kg	220	220	0.02 U	0.02 U	0.02 U	0.02 U	**0.04**	NA
Fluorene	mg/kg	270	200	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	NA
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**	NA
Naphthalene	mg/kg	100	39	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA
Phenanthrene	mg/kg	--	--	0.05 U	0.05 U	0.06 U	0.05 U	0.06 U	NA
Pyrene	mg/kg	140	140	0.02 U	0.02 U	0.02 U	0.02 U	**0.03**	NA
Volatiles	UNITS								
Benzene	ug/kg	9,800	80	5.4 U	5.5 U	5.6 U	5.3 U	6 UJ	6 UJ
Ethylbenzene	ug/kg	650,000	55,000	5.4 U	5.5 U	5.6 U	5.3 U	6 UJ	6 UJ
m,p-Xylene	ug/kg	700,000	700,000	5.4 U	5.5 U	5.6 U	5.3 U	6 UJ	6 UJ
o-Xylene	ug/kg	700,000	700,000	11 U	11 U	11 U	11 U	12 UJ	12 UJ
Toluene	ug/kg	930,000	40,000	5.4 U	5.5 U	5.6 U	5.3 U	6 UJ	6 UJ

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).

Analytical results in excess of RSK values are shaded.

2. All positive detections are in **bold**.

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-6 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B166 - B173
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B170/SB02	B170/SB02	B170/SB11	B170/SB11	B170/SB03	B170/SB04
			Date Sampled:	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001
			Sample Depth From:	1	1	1	1	4	7
			Sample Depth To:	4	4	4	4	7	10
			Laboratory Number:	01102408	01102408R	01102411 Duplicate	01102411R Re-analysis	01102409	01102410
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Anthracene	mg/kg	13	13	0.06 U	NA	0.06 U	NA	0.05 U	0.06 U
Benzo(a)anthracene	mg/kg	12	10	**0.03**	NA	**0.02**	NA	**0.02**	**0.06**
Benzo(a)pyrene	mg/kg	1.2	16	**0.03**	NA	**0.03**	NA	**0.03**	**0.04**
Benzo(b)fluoranthene	mg/kg	12	19	**0.04**	NA	**0.04**	NA	**0.04**	**0.06**
Benzo(g,h,i)perylene	mg/kg	--	--	**0.05**	NA	**0.05**	NA	**0.04**	**0.06**
Benzo(k)fluoranthene	mg/kg	10	10	**0.02**	NA	**0.02**	NA	**0.01**	**0.03**
Chrysene	mg/kg	6.4	6.4	**0.03**	NA	**0.04**	NA	**0.03**	**0.06**
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	NA	**0.01**	NA	0.01 U	**0.01**
Fluoranthene	mg/kg	220	220	**0.06**	NA	**0.04**	NA	**0.06**	**0.15**
Fluorene	mg/kg	270	200	0.02 U	NA	0.02 U	NA	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	**0.02**	NA	**0.02**	NA	**0.03**	**0.03**
Naphthalene	mg/kg	100	39	0.1 U	NA	0.1 U	NA	0.1 U	0.1 U
Phenanthrene	mg/kg	--	--	**0.06**	NA	**0.16**	NA	**0.11**	**0.17**
Pyrene	mg/kg	140	140	**0.04**	NA	**0.04**	NA	**0.04**	**0.1**
Volatiles	UNITS								
Benzene	ug/kg	9,800	80	5.5 UJ	5.5 UJ	5.6 UJ	5.6 UJ	5.4 U	5.6 U
Ethylbenzene	ug/kg	650,000	55,000	5.5 UJ	5.5 UJ	5.6 UJ	5.6 UJ	5.4 U	5.6 U
m,p-Xylene	ug/kg	700,000	700,000	5.5 UJ	5.5 UJ	5.6 UJ	5.6 UJ	5.4 U	5.6 U
o-Xylene	ug/kg	700,000	700,000	11 UJ	11 UJ	11 UJ	11 UJ	11 U	11 U
Toluene	ug/kg	930,000	40,000	5.5 UJ	5.5 UJ	5.6 UJ	5.6 UJ	5.4 U	5.6 U

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-6 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B166 - B173
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B171/SB01	B171/SB02	B171/SB03	B171/SB04	B171/SB05	B172/SB01
			Date Sampled:	10/25/2001	10/25/2001	10/25/2001	10/25/2001	10/25/2001	10/25/2001
			Sample Depth From:	0	1	4	7	25.5	0
			Sample Depth To:	1	4	7	10	26	1
			Laboratory Number:	01102858	01102859	01102860	01102861	01102862	01102842
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Anthracene	mg/kg	13	13	0.06 U	0.06 U	0.06 U	0.05 U	0.05 U	0.06 U
Benzo(a)anthracene	mg/kg	12	10	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.03**
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.06**
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.05**
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.17**
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.04**
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.03**
Fluoranthene	mg/kg	220	220	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	**0.03**
Fluorene	mg/kg	270	200	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.02**
Naphthalene	mg/kg	100	39	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Phenanthrene	mg/kg	--	--	0.06 U	0.06 U	0.06 U	0.05 U	0.05 U	**0.06**
Pyrene	mg/kg	140	140	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	**0.05**
Volatiles	UNITS								
Benzene	ug/kg	9,800	80	5.7 U	5.8 U	5.7 U	5.3 U	5.3 U	5.8 U
Ethylbenzene	ug/kg	650,000	55,000	5.7 U	5.8 U	5.7 U	5.3 U	5.3 U	5.8 U
m,p-Xylene	ug/kg	700,000	700,000	5.7 U	5.8 U	5.7 U	5.3 U	5.3 U	5.8 U
o-Xylene	ug/kg	700,000	700,000	11 U	12 U	11 U	11 U	11 U	12 U
Toluene	ug/kg	930,000	40,000	5.7 U	5.8 U	5.7 U	5.3 U	5.3 U	5.8 U

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold**.

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-6 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B166 - B173

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Point:				B172/SB02	B172/SB03	B172/SB04	B172/SB11	B172/SB05	B172/SB06
Date Sampled:				10/25/2001	10/25/2001	10/25/2001	10/25/2001	10/25/2001	10/25/2001
Sample Depth From:				1	4	7	7	15.5	21
Sample Depth To:				4	7	10	10	16	21.5
Laboratory Number:				01102843	01102844	01102845	01102846 Duplicate	01102847	01102848
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Anthracene	mg/kg	13	13	0.06 U	0.06 U	0.05 U	0.05 U	0.06 U	0.06 U
Benzo(a)anthracene	mg/kg	12	10	**0.02**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	**0.02**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	**0.04**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	**0.03**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	**0.02**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	**0.04**	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Fluorene	mg/kg	270	200	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	**0.02**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Naphthalene	mg/kg	100	39	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	**0.2 J**
Phenanthrene	mg/kg	--	--	**0.13**	0.06 U	0.05 U	0.05 U	0.06 U	0.06 U
Pyrene	mg/kg	140	140	**0.05**	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Volatiles	UNITS								
Benzene	ug/kg	9,800	80	5.7 U	5.6 U	5.5 U	5.4 U	5.5 U	290 UR
Ethylbenzene	ug/kg	650,000	55,000	5.7 U	5.6 U	5.5 U	5.4 U	5.5 U	290 UR
m,p-Xylene	ug/kg	700,000	700,000	5.7 U	5.6 U	5.5 U	5.4 U	5.5 U	1,020 R
o-Xylene	ug/kg	700,000	700,000	11 U	11 U	11 U	11 U	11 U	480 R
Toluene	ug/kg	930,000	40,000	5.7 U	5.6 U	5.5 U	5.4 U	5.5 U	290 UR

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold**.

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-6 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B166 - B173
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B172/SB06	B172/SB07	B172/SB07	B173/SB01	B173/SB01	B173/SB02
			Date Sampled:	10/25/2001	10/25/2001	10/25/2001	10/25/2001	10/25/2001	10/25/2001
			Sample Depth From:	21	29.5	29.5	0	0	1
			Sample Depth To:	21.5	30	30	1	1	4
			Laboratory Number:	01102848R Re-analysis	01102849I	01102849 Re-analysis	01102850	01102850R Re-analysis	01102851
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Anthracene	mg/kg	13	13	0.06 U	NA	0.06 U	0.2 UJ	0.4 UR	0.6 UJ
Benzo(a)anthracene	mg/kg	12	10	0.01 U	NA	**0.01**	**0.08 J**	0.1 R	**0.1 J**
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	NA	**0.01**	**0.07 J**	0.09 UR	**0.1 J**
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	NA	**0.01**	**0.1 J**	0.2 R	**0.2 J**
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	NA	**0.01**	**0.07 J**	0.09 UR	**0.1 J**
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	NA	0.01 U	0.04 UJ	0.09 UR	0.1 UJ
Chrysene	mg/kg	6.4	6.4	0.01 U	NA	**0.02**	**0.1 J**	0.2 R	**0.2 J**
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	NA	0.01 U	0.04 UJ	0.09 UR	0.1 UJ
Fluoranthene	mg/kg	220	220	0.02 U	NA	**0.05**	**0.2 J**	0.2 R	**0.3 J**
Fluorene	mg/kg	270	200	0.02 U	NA	**0.03**	0.09 UJ	0.2 UR	0.2 UJ
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	NA	0.01 U	0.04 UJ	0.09 UR	0.1 UJ
Naphthalene	mg/kg	100	39	0.1 U	NA	**3.9**	**0.5 J**	0.9 UR	1 UJ
Phenanthrene	mg/kg	--	--	0.06 U	NA	**0.06**	**0.95 J**	1.2 R	**1.6 J**
Pyrene	mg/kg	140	140	0.02 U	NA	**0.06**	**0.2 J**	0.2 R	**0.3 J**
Volatiles	UNITS								
Benzene	ug/kg	9,800	80	NA	**124 J**	5,800 UJ	5.5 U	NA	5.5 UJ
Ethylbenzene	ug/kg	650,000	55,000	NA	**OVERCAL**	**7,400 J**	5.5 U	NA	5.5 UJ
m,p-Xylene	ug/kg	700,000	700,000	NA	**OVERCAL**	**29,700 J**	5.5 U	NA	5.5 UJ
o-Xylene	ug/kg	700,000	700,000	NA	**190 J**	12,000 UJ	11 U	NA	11 UJ
Toluene	ug/kg	930,000	40,000	NA	**139 J**	5,800 UJ	5.5 U	NA	5.5 UJ

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
   ▨ Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold**.

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-6 (continued)
Building 354/332/DPW Compound Soil-Sampling Results
Locations B166 - B173
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B173/SB02	B173/SB03	B173/SB04	B173/SB05	B173/SB06
			Date Sampled:	10/25/2001	10/25/2001	10/25/2001	10/25/2001	10/25/2001
			Sample Depth From:	1	4	7	20	23.5
			Sample Depth To:	4	7	10	21	24
			Laboratory Number:	01102851R Re-analysis	01102852	01102853	01102863	01102864
		RSK Soil Pathway	RSK Soil to GW Pathway					
PAHs	UNITS							
Anthracene	mg/kg	13	13	1 UR	0.05 U	0.05 U	0.05 U	0.06 U
Benzo(a)anthracene	mg/kg	12	10	0.2 R	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	0.2 UR	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	0.4 R	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	0.2 UR	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.2 UR	0.01 U	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	0.4 R	0.01 U	0.01 U	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.2 UR	0.01 U	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	0.6 R	0.02 U	0.02 U	0.02 U	0.02 U
Fluorene	mg/kg	270	200	0.4 UR	0.02 U	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.2 UR	0.01 U	0.01 U	0.01 U	0.01 U
Naphthalene	mg/kg	100	39	2 UR	0.1 U	0.1 U	0.1 U	**0.8**
Phenanthrene	mg/kg	--	--	2.6 R	0.05 U	0.05 U	0.05 U	0.06 U
Pyrene	mg/kg	140	140	0.4 UR	0.02 U	0.02 U	0.02 U	0.02 U
Volatiles	UNITS							
Benzene	ug/kg	9,800	80	5.5 UJ	5.5 U	5.4 U	5.2 U	560 UJ
Ethylbenzene	ug/kg	650,000	55,000	5.5 UJ	5.5 U	5.4 U	5.2 U	560 UJ
m,p-Xylene	ug/kg	700,000	700,000	5.5 UJ	5.5 U	5.4 U	5.2 U	560 UJ
o-Xylene	ug/kg	700,000	700,000	11 UJ	11 U	11 U	10 U	1,100 UJ
Toluene	ug/kg	930,000	40,000	5.5 UJ	5.5 U	5.4 U	5.2 U	560 UJ

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
Analytical results in excess of RSK values are shaded.
2. All positive detections are in **bold**.

-- No regulatory value available
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-7
Building 430 Soil-Gas Survey Results
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported DCE ug/L*	*Reported CCl_4 ug/L*	*Reported TCE ug/L*	*Reported PCE ug/L*	*Reported BTEX ug/L*
B864	9'	07/02/01	2U	0.4J	2U	2U	2U
B864	15'	07/02/01	2U	0.4J	2U	2U	2U
B871	9'	06/21/01	2U	2U	2U	2U	2U
B871	15'	06/21/01	2U	2U	2U	2U	2U
B872	9'	06/21/01	2U	2U	2U	2U	2U
B872	15'	06/21/01	2U	2U	2U	2U	2U
B873	9'	06/21/01	2U	2U	2U	2U	2U
B873	15'	06/21/01	2U	2U	2U	2U	2U
B873 Dup	15'	06/21/01	2U	2U	2U	2U	2U
B874	9'	06/27/01	2U	1.4	2U	2U	2U
B874	15'	06/27/01	2U	2U	2U	2U	2U
B875	9'	06/27/01	2U	4.2	2U	2U	2U
B875	15'	06/27/01	2U	1.7J	2U	2U	2U
B876	9'	06/27/01	2U	1.9J	2U	2U	2U
B876	15'	06/27/01	2U	2U	2U	2U	2U
B876 Dup	15'	06/27/01	2U	2U	2U	2U	2U
B879	9'	06/28/01	2U	2U	2U	2U	2U
B879	15'	06/28/01	2U	2U	2U	2U	2U
B879 Dup	15'	06/28/01	2U	2U	2U	2U	2U
B880	9'	06/25/01	2U	2U	2U	2U	2U
B880	15'	06/25/01	2U	2U	2U	2U	2U
B881	9'	06/19/01	2U	2U	2U	2U	2U
B881	15'	06/19/01	2U	2U	2U	2U	2U
B882	9'	06/21/01	2U	2U	2U	2U	2U
B882	15'	06/21/01	2U	2U	2U	2U	2U
B883	9'	06/19/01	2U	2U	2U	2U	2U
B883	15'	06/19/01	2U	2U	2U	2U	2U
B883 Dup	15'	06/19/01	2U	2U	2U	2U	2U
B884	9'	06/21/01	2U	2U	2U	2U	2U
B884	15'	06/21/01	2U	2U	2U	2U	2U
B885	9'	06/19/01	2U	0.1J	2U	2U	2U
B885	15'	06/19/01	2U	2U	2U	2U	2U
B886	9'	06/21/01	2U	1.0J	2U	2U	2U
B886	15'	06/21/01	2U	2U	2U	2U	2U
B887	9'	06/27/01	2U	8.8	2U	2U	2U
B887	15'	06/27/01	2U	1.1J	2U	2U	2U
B888	9'	06/26/01	2U	12	0.4J	2U	2U
B888	15'	06/26/01	2U	0.5J	2U	2U	2U
B889	9'	06/26/01	2U	3.3	2U	2U	2U
B889	15'	06/26/01	2U	2U	2U	2U	2U
B889 Dup	15'	06/26/01	2U	2U	2U	2U	2U
B892	9'	06/25/01	2U	2U	2U	2U	2U

Table 5-7 (continued)
Building 430 Soil-Gas Survey Results
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported DCE ug/L*	*Reported CCl_4 ug/L*	*Reported TCE ug/L*	*Reported PCE ug/L*	*Reported BTEX ug/L*
B892	15'	06/25/01	2U	2U	2U	2U	2U
B892 Dup	15'	06/25/01	2U	2U	2U	2U	2U
B893	9'	06/20/01	2U	0.2J	2U	2U	2U
B893	15'	06/20/01	2U	2U	2U	2U	2U
B894	9'	06/20/01	2U	2U	2U	2U	2U
B894	15'	06/20/01	2U	2U	2U	2U	2U
B895	9'	06/20/01	2U	2U	2U	2U	2U
B895	15'	06/20/01	2U	2U	2U	2U	2U
B896	9'	06/21/01	2U	0.5J	2U	2U	2U
B896	15'	06/21/01	2U	2U	2U	2U	2U
B897	9'	06/21/01	2U	2U	2U	2U	2U
B897	15'	06/21/01	2U	2U	2U	2U	2U
B897 Dup	15'	06/21/01	2U	2U	2U	2U	2U
B898	9'	06/21/01	2U	0.3J	2U	2U	2U
B898	15'	06/21/01	2U	0.4J	2U	2U	2U
B899	9'	06/21/01	2U	2.2	2U	2U	2U
B899	15'	06/21/01	2U	2U	2U	2U	2U
B900	9'	06/22/01	2U	1.2J	2U	2U	2U
B900	15'	06/22/01	2U	0.2J	2U	2U	2U
B901	9'	06/27/01	2U	12	2U	2U	2U
B901	15'	06/27/01	2U	0.4J	0.4J	2U	2U
B902	9'	06/26/01	2U	5.8	0.2J	2U	2U
B902	15'	06/26/01	2U	1.5J	2U	2U	2U
B903	9'	06/26/01	2U	2.2	2U	2U	2U
B903	15'	06/26/01	2U	0.4J	2U	2U	2U
B907	9'	06/19/01	2U	2U	2U	2U	2U
B907	15'	06/19/01	2U	2U	2U	2U	2U
B908	9'	06/20/01	2U	0.1J	2U	2U	2U
B908	15'	06/20/01	2U	2U	2U	2U	2U
B908 Dup	15'	06/20/01	2U	2U	2U	2U	2U
B909	9'	06/18/01	2U	2U	2U	2U	2U
B909	15'	06/18/01	2U	2U	2U	2U	2U
B909 Dup	15'	06/18/01	2U	2U	2U	2U	2U
B910	9'	06/20/01	2U	0.2J	2U	2U	2U
B910	15'	06/20/01	2U	2U	2U	2U	2U
B911	9'	06/18/01	2U	0.4J	2U	2U	2U
B911	15'	06/18/01	2U	2U	2U	2U	2U
B912	9'	06/22/01	2U	0.8J	2U	2U	2U
B912	15'	06/22/01	2U	2U	2U	2U	2U
B913	9'	06/20/01	2U	4.2	2U	2U	2U
B913	15'	06/20/01	2U	0.2J	0.2J	2U	2U
B914	9'	06/22/01	2U	2.6	2U	2U	2U

Table 5-7 (continued)
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Sample Number	*Sample Depth*	*Date*	*Reported DCE ug/L*	*Reported CCl_4 ug/L*	*Reported TCE ug/L*	*Reported PCE ug/L*	*Reported BTEX ug/L*
B914	15'	06/22/01	2U	2U	2U	2U	2U
B914 Dup	15'	06/22/01	2U	2U	2U	2U	2U
B915	9'	06/20/01	2U	16	0.1J	2U	2U
B915	15'	06/20/01	2U	0.2J	2U	2U	2U
B915 Dup	15'	06/20/01	2U	0.2J	2U	2U	2U
B916	9'	06/26/01	2U	9.9	0.3J	2U	2U
B916	15'	06/26/01	2U	2U	2U	2U	2U
B917	9'	06/26/01	2U	4.0	2U	2U	2U
B917	15'	06/26/01	2U	2U	2U	2U	2U
B918	9'	06/26/01	2U	5.0	0.2J	2U	2U
B918	15'	06/26/01	2U	6.2	0.3J	2U	2U
B922	9'	06/25/01	2U	2U	2U	2U	2U
B922	15'	06/25/01	2U	2U	2U	2U	2U
B923	9'	06/25/01	2U	2U	2U	2U	2U
B923	15'	06/25/01	2U	2U	2U	2U	2U
B924	9'	06/22/01	2U	14	0.8J	2U	2U
B924	15'	06/22/01	2U	0.6J	2U	2U	2U
B925	9'	06/27/01	2U	14	0.7J	2U	2U
B925	15'	06/27/01	2U	0.7J	2U	2U	2U
B926	9'	06/27/01	2U	5.7	0.2J	2U	2U
B926	15'	06/27/01	2U	2U	2U	2U	2U
B927	9'	06/27/01	2U	3.3	2U	2U	2U
B927	15'	06/27/01	2U	0.2J	2U	2U	2U
B927 Dup	15'	06/27/01	2U	0.2J	2U	2U	2U
B930	9'	06/25/01	2U	2U	2U	2U	2U
B930	15'	06/25/01	2U	2U	2U	2U	2U
B931	9'	06/28/01	2U	2U	2U	2U	2U
B931	15'	06/28/01	2U	2U	2U	2U	2U
B932	9'	06/19/01	2U	2U	2U	2U	2U
B932	15'	06/19/01	2U	2U	2U	2U	2U
B933	9'	06/19/01	2U	2U	2U	2U	2U
B933	15'	06/19/01	2U	2U	2U	2U	2U
B934	9'	06/28/01	2U	12	0.8J	2U	2U
B934	15'	06/28/01	2U	1.1J	0.2J	2U	2U
B935	9'	06/20/01	2U	4.6	2U	2U	2U
B935	15'	06/20/01	2U	2U	2U	2U	2U
B936	9'	06/22/01	2U	1.6J	2U	2U	2U
B936	15'	06/22/01	2U	2U	2U	2U	2U
B937	9'	06/26/01	2U	2.9	2U	2U	2U
B937	15'	06/26/01	2U	0.2J	2U	2U	2U
B943	9'	06/28/01	2U	12	0.7J	2U	2U
B943	15'	06/28/01	2U	2U	2U	2U	2U

Table 5-7 (continued)
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B944	9'	06/27/01	2U	0.4J	2U	2U	2U
B944	15'	06/27/01	2U	2U	2U	2U	2U
B945	9'	06/22/01	2U	2U	2U	2U	2U
B945	15'	06/22/01	2U	2U	2U	2U	2U
B946	9'	06/26/01	2U	2.4	2U	2U	2U
B946	15'	06/26/01	2U	2U	2U	2U	2U
B950	9'	06/25/01	2U	2U	2U	2U	2U
B950	15'	06/25/01	2U	2U	2U	2U	2U
B952	9'	06/18/01	2U	2U	2U	2U	2U
B952	15'	06/18/01	2U	2U	2U	2U	2U
B954	9'	06/18/01	2U	2U	2U	2U	2U
B954	15'	06/18/01	2U	2U	2U	2U	2U
B955	9'	06/22/01	2U	0.2J	2U	2U	2U
B955	15'	06/22/01	2U	2U	2U	2U	2U
B955 Dup	15'	06/22/01	2U	2U	2U	2U	2U
B956	9'	06/18/01	2U	2U	2U	2U	2U
B956	15'	06/18/01	2U	0.6J	2U	2U	2U
B957	9'	06/22/01	2U	1.5J	2U	2U	2U
B957	15'	06/22/01	2U	2U	2U	2U	2U
B958	9'	06/28/01	2U	4.1	0.3J	2U	2U
B958	15'	06/28/01	2U	2U	2U	2U	2U
B959	9'	06/28/01	2U	0.4J	2U	2U	2U
B959	15'	06/28/01	2U	0.1J	2U	2U	2U
B960	9'	06/28/01	2U	0.4J	2U	2U	2U
B960	15'	06/28/01	2U	2U	2U	2U	2U
B961	9'	06/28/01	2U	0.7J	2U	2U	2U
B961	15'	06/28/01	2U	2U	2U	2U	2U
B969	9'	06/25/01	2U	2U	2U	2U	2U
B969	15'	06/25/01	2U	2U	2U	2U	2U
B970	9'	06/25/01	2U	2U	2U	2U	2U
B970	15'	06/25/01	2U	2U	2U	2U	2U
B970 Dup	15'	06/25/01	2U	2U	2U	2U	2U
B971	9'	06/22/01	2U	2U	2U	2U	2U
B971	15'	06/22/01	2U	2U	2U	2U	2U
B972	9'	06/20/01	2U	2U	2U	2U	2U
B972	15'	06/20/01	2U	2U	2U	2U	2U
B973	9'	06/29/01	2U	0.6J	2U	2U	2U
B973	15'	06/29/01	2U	2U	2U	2U	2U
B974	9'	06/28/01	2U	0.2J	2U	2U	2U
B974	15'	06/28/01	2U	2U	2U	2U	2U
B975	9'	06/28/01	2U	0.4J	2U	2U	2U
B975	15'	06/28/01	2U	2U	2U	2U	2U

Table 5-7 (continued)
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B975 Dup	15'	06/28/01	2U	2U	2U	2U	2U
B980	9'	06/25/01	2U	2U	2U	2U	2U
B980	15'	06/25/01	2U	2U	2U	2U	2U
B982	9'	06/19/01	2U	2U	2U	2U	2U
B982	15'	06/19/01	2U	2U	2U	2U	2U
B894	9'	06/19/01	2U	2U	2U	2U	2U
B984	15'	06/19/01	2U	2U	2U	2U	2U
B987	9'	06/29/01	2U	0.4J	2U	2U	2U
B987	15'	06/29/01	2U	1.0J	2U	2U	2U
B988	9'	06/29/01	2U	2U	2U	2U	2U
B988	15'	06/29/01	2U	2U	2U	2U	2U
B988 Dup	15'	06/29/01	2U	2U	2U	2U	2U
B999	9'	06/29/01	2U	2U	2U	2U	2U
B999	15'	06/29/01	2U	2U	2U	2U	2U
B1000	9'	06/29/01	2U	2U	2U	2U	2U
B1000	15'	06/29/01	2U	2U	2U	2U	2U
B1000 Dup	15'	06/29/01	2U	2U	2U	2U	2U
B1022	9'	07/02/01	2U	2U	2U	2U	2U
B1022	15'	07/02/01	2U	2U	2U	2U	2U
B1022 Dup	15'	07/02/01	2U	2U	2U	2U	2U
B1023	9'	07/02/01	2U	0.2J	2U	2U	2U
B1023	15'	07/02/01	2U	0.2J	2U	2U	2U
B1024	9'	07/02/01	2U	1.3J	2U	2U	2U
B1024	15'	07/02/01	2U	1.6J	2U	2U	2U
B1025	9'	07/03/01	2U	2.5	2U	2U	2U
B1025	15'	07/03/01	2U	2U	2U	2U	2U
B1026	9'	07/03/01	2U	3.6	2U	2U	2U
B1026	15'	07/03/01	2U	1.6J	2U	2U	2U
B1027	9'	07/03/01	2U	4.0	2U	2U	2U
B1027	15'	07/03/01	2U	0.7J	2U	2U	2U
B1028	9'	07/03/01	2U	2.6	2U	2U	2U
B1028	9'	07/09/01	2U	0.3J	2U	2U	2U
B1028	15'	07/03/01	2U	0.2J	2U	2U	2U
B1028	15'	07/09/01	2U	2U	2U	2U	2U
B1029	9'	07/03/01	2U	0.4J	2U	2U	2U
B1029	15'	07/03/01	2U	2.0	2U	2U	2U
B1029 Dup	15'	07/03/01	2U	1.9J	2U	2U	2U
B1030	9'	06/29/01	2U	2.0J	2U	2U	2U
B1030	15'	06/29/01	2U	2U	2U	2U	2U
B1031	9'	07/03/01	2U	0.5J	2U	2U	2U
B1031	9'	07/09/01	2U	0.1J	2U	2U	2U
B1031	15'	07/03/01	2U	2U	2U	2U	2U

Table 5-7 (continued)
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Sample Number	*Sample Depth*	*Date*	*Reported DCE ug/L*	*Reported CCl_4 ug/L*	*Reported TCE ug/L*	*Reported PCE ug/L*	*Reported BTEX ug/L*
B1031	15'	07/09/01	2U	2U	2U	2U	2U
B1032	9'	07/02/01	2U	2U	2U	2U	2U
B1032	15'	07/02/01	2U	2U	2U	2U	2U
B1033	9'	07/02/01	2U	0.2J	2U	2U	2U
B1033	15'	07/02/01	2U	2U	2U	2U	2U
B1034	15'	07/02/01	2U	2U	2U	2U	2U
B1034	9'	07/02/01	2U	1.3J	2U	2U	2U
B1035	9'	06/29/01	2U	1.7J	2U	2U	2U
B1035	15'	06/29/01	2U	2U	2U	2U	2U
B1036	9'	07/02/01	2U	3.1	0.2J	2U	2U
B1036	15'	07/02/01	2U	6.8	0.2J	2U	2U
B1036 Dup	15'	07/02/01	2U	6.1	0.2J	2U	2U
B1037	9'	06/29/01	2U	1.3J	2U	2U	2U
B1037	15'	06/29/01	2U	0.2J	2U	2U	2U
B1038	9'	07/02/01	2U	1.2J	2U	2U	2U
B1038	15'	07/02/01	2U	0.2J	2U	2U	2U
B1039	9'	07/03/01	2U	1.0J	2U	2U	2U
B1039	9'	07/09/01	2U	0.4J	2U	2U	2U
B1039	15'	07/03/01	2U	2U	2U	2U	2U
B1039	15'	07/09/01	2U	1.5J	2U	2U	2U
B1040	9'	07/03/01	2U	0.2J	2U	2U	2U
B1040	9'	07/09/01	2U	2U	2U	2U	2U
B1040	15'	07/03/01	2U	2U	2U	2U	2U
B1040	15'	07/09/01	2U	2U	2U	2U	2U
B1040 Dup	15'	07/03/01	2U	2U	2U	2U	2U
B1040 Dup	15'	07/09/01	2U	2U	2U	2U	2U
B1041	9'	06/29/01	2U	0.4J	2U	2U	2U
B1041	15'	06/29/01	2U	2U	2U	2U	2U
B1042	9'	06/29/01	2U	2U	2U	2U	2U
B1042	15'	06/29/01	2U	2U	2U	2U	2U
B1043	9'	07/17/01	2U	2U	2U	2U	2U
B1043	15'	07/17/01	2U	2U	2U	2U	2U
B1044	9'	07/17/01	2U	2U	2U	2U	2U
B1044	15'	07/17/01	2U	2U	2U	2U	2U
B1045	9'	07/11/01	2U	0.3J	2U	2U	2U
B1045	15'	07/11/01	2U	2U	2U	2U	2U
B1046	9'	07/16/01	2U	0.8J	2U	2U	2U
B1046	15'	07/16/01	2U	2U	2U	2U	2U
B1047	9'	07/03/01	2U	1.6J	2U	2U	2U
B1047	15'	07/03/01	2U	2U	2U	2U	2U
B1048	9'	07/10/01	2U	0.6J	2U	2U	2U
B1048	15'	07/10/01	2U	1.0J	2U	2U	2U

Table 5-7 (continued)
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B1048 Dup	15'	07/10/01	2U	0.9J	2U	2U	2U
B1050	9'	07/12/01	2U	1.4J	2U	2U	2U
B1050	15'	07/12/01	2U	0.1J	2U	2U	2U
B1051	9'	07/10/01	2U	0.6J	2U	2U	2U
B1051	15'	07/10/01	2U	2U	2U	2U	2U
B1052	9'	07/12/01	2U	0.2J	2U	2U	2U
B1052	15'	07/12/01	2U	2U	2U	2U	2U
B1054	9'	07/10/01	2U	0.2J	2U	2U	2U
B1054	15'	07/10/01	2U	2U	2U	2U	2U
B1055	9'	07/11/01	2U	2U	2U	2U	2U
B1055	15'	07/11/01	2U	2U	2U	2U	2U
B1056	9'	07/12/01	2U	0.3J	2U	2U	2U
B1056	15'	07/12/01	2U	2U	2U	2U	2U
B1056 Dup	15'	07/12/01	2U	2U	2U	2U	2U
B1057	9'	07/12/01	2U	0.7J	2U	2U	2U
B1057	15'	07/12/01	2U	2U	2U	2U	2U
B1058	9'	07/12/01	2U	0.7J	2U	2U	2U
B1058	15'	07/12/01	2U	2.6	2U	2U	2U
B1059	9'	07/12/01	2U	0.7J	2U	2U	2U
B1059	15'	07/12/01	2U	0.4J	2U	2U	2U
B1060	9'	07/12/01	2U	0.3J	2U	2U	2U
B1060	15'	07/12/01	2U	2U	2U	2U	2U
B1060 Dup	15'	07/12/01	2U	2U	2U	2U	2U
B1061	9'	07/13/01	2U	0.2J	2U	2U	2U
B1061	15'	07/13/01	2U	2U	2U	2U	2U
B1062	9'	07/13/01	2U	2U	2U	2U	2U
B1062	15'	07/13/01	2U	2U	2U	2U	2U
B10631	9'	07/13/01	2U	0.2J	2U	2U	2U
B10631	15'	07/13/01	2U	2U	2U	2U	2U
B1064	9'	07/10/01	2U	2U	2U	2U	2U
B1064	15'	07/10/01	2U	2U	2U	2U	2U
B1065	9'	07/16/01	2U	2U	2U	2U	2U
B1065	15'	07/16/01	2U	2U	2U	2U	2U
B1067	9'	07/16/01	2U	0.5J	2U	2U	2U
B1067	15'	07/16/01	2U	2U	2U	2U	2U
B1069	9'	07/16/01	2U	0.2J	2U	2U	2U
B1069	15'	07/16/01	2U	2U	2U	2U	2U
B1070	9'	07/12/01	2U	0.2J	2U	2U	2U
B1070	15'	07/12/01	2U	2U	2U	2U	2U
B1071	9'	07/12/01	2U	2U	2U	2U	2U
B1071	15'	07/12/01	2U	2U	2U	2U	2U
B1072	9'	07/10/01	2U	0.2J	2U	2U	2U

Table 5-7 (continued)
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Sample Number	*Sample Depth*	*Date*	*Reported DCE ug/L*	*Reported CCl_4 ug/L*	*Reported TCE ug/L*	*Reported PCE ug/L*	*Reported BTEX ug/L*
B1072	15'	07/10/01	2U	2U	2U	2U	2U
B10721	9'	07/13/01	2U	2U	2U	2U	2U
B10721	15'	07/13/01	2U	2U	2U	2U	2U
B1073	9'	07/11/01	2U	2U	2U	2U	2U
B1073	15'	07/11/01	2U	2U	2U	2U	2U
B1074	9'	07/11/01	2U	2U	2U	2U	2U
B1074	15'	07/11/01	2U	2U	2U	2U	2U
B1075	9'	07/11/01	2U	0.2J	2U	2U	2U
B1075	15'	07/11/01	2U	2U	2U	2U	2U
B1076	9'	07/11/01	2U	0.3J	2U	2U	2U
B1076	15'	07/11/01	2U	2U	2U	2U	2U
B1077	9'	07/16/01	2U	0.1J	2U	2U	2U
B1077	15'	07/16/01	2U	2U	2U	2U	2U
B1078	9'	07/16/01	2U	2U	2U	2U	2U
B1078	15'	07/16/01	2U	2U	2U	2U	2U
B1079	9'	07/16/01	2U	2U	2U	2U	2U
B1079	15'	07/16/01	2U	2U	2U	2U	2U
B1080	9'	07/12/01	2U	2U	2U	2U	2U
B1080	15'	07/12/01	2U	2U	2U	2U	2U
B1081	9'	07/13/01	2U	0.1J	2U	2U	2U
B1081	15'	07/13/01	2U	2U	2U	2U	2U
B10811	9'	07/13/01	2U	2U	2U	2U	2U
B10811	15'	07/13/01	2U	2U	2U	2U	2U
B1082	9'	07/10/01	2U	2U	2U	2U	2U
B1082	15'	07/10/01	2U	2U	2U	2U	2U
B1084	9'	07/09/01	2U	2U	2U	2U	2U
B1084	15'	07/09/01	2U	2U	2U	2U	2U
B1085	9'	07/11/01	2U	2U	2U	2U	2U
B1085	15'	07/11/01	2U	2U	2U	2U	2U
B1085 Dup	15'	07/11/01	2U	2U	2U	2U	2U
B1087	9'	07/16/01	2U	2U	2U	2U	2U
B1087	15'	07/16/01	2U	2U	2U	2U	2U
B1087 Dup	15'	07/16/01	2U	2U	2U	2U	2U
B1090	9'	07/10/01	2U	2U	2U	2U	2U
B1090	15'	07/10/01	2U	2U	2U	2U	2U
B1094	9'	07/11/01	2U	2U	2U	2U	2U
B1094	15'	07/11/01	2U	2U	2U	2U	2U
B1095	9'	07/11/01	2U	2U	2U	2U	2U
B1095	15'	07/11/01	2U	2U	2U	2U	2U
B1095 Dup	15'	07/11/01	2U	2U	2U	2U	2U
B1096	9'	07/11/01	2U	2U	2U	2U	2U
B1096	15'	07/11/01	2U	2U	2U	2U	2U

Table 5-7 (continued)
Building 430 Soil-Gas Survey Results
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported DCE ug/L*	*Reported CCl_4 ug/L*	*Reported TCE ug/L*	*Reported PCE ug/L*	*Reported BTEX ug/L*
B1100	9'	07/10/01	2U	2U	2U	2U	2U
B1100	15'	07/10/01	2U	2U	2U	2U	2U
B1102	9'	07/09/01	2U	2U	2U	2U	2U
B1102	15'	07/09/01	2U	2U	2U	2U	2U
B1104	9'	07/09/01	2U	2U	2U	2U	2U
B1104	15'	07/09/01	2U	2U	2U	2U	2U
B1104 Dup	15'	07/09/01	2U	2U	2U	2U	2U
B1108	9'	07/10/01	2U	2U	2U	2U	2U
B1108	15'	07/10/01	2U	2U	2U	2U	2U
B1120	9'	07/09/01	2U	2U	2U	2U	2U
B1120	15'	07/09/01	2U	2U	2U	2U	2U
B1125	9'	07/10/01	2U	2U	2U	2U	2U
B1125	15'	07/10/01	2U	2U	2U	2U	2U
B1125 Dup	15'	07/10/01	2U	2U	2U	2U	2U
B1126	9'	07/13/01	2U	0.1J	2U	2U	2U
B1126	15'	07/13/01	2U	0.1J	2U	2U	2U
B1126 Dup	15'	07/13/01	2U	0.1J	2U	2U	2U
B1127	9'	07/13/01	2U	0.2J	2U	2U	2U
B1127	15'	07/13/01	2U	2U	2U	2U	2U
B1128	9'	07/13/01	2U	2U	2U	2U	2U
B1128	15'	07/13/01	2U	2U	2U	2U	2U
B1128 Dup	15'	07/13/01	2U	2U	2U	2U	2U
B1129	9'	07/13/01	2U	0.5J	2U	2U	2U
B1129	15'	07/13/01	2U	2U	2U	2U	2U
B1130	9'	07/17/01	2U	2U	2U	2U	2U
B1130	15'	07/17/01	2U	2U	2U	2U	2U
B1130 Dup	15'	07/17/01	2U	2U	2U	2U	2U
B1131	9'	07/17/01	2U	2U	2U	2U	2U
B1131	15'	07/17/01	2U	2U	2U	2U	2U
B1133	9'	07/17/01	2U	2U	2U	2U	2U
B1133	15'	07/17/01	2U	2U	2U	2U	2U
B1136	9'	07/17/01	2U	2U	2U	2U	2U
B1136	15'	07/17/01	2U	2U	2U	2U	2U
B1146	9'	07/16/01	2U	2U	2U	2U	2U
B1146	15'	07/16/01	2U	2U	2U	2U	2U
B1146 Dup	15'	07/16/01	2U	2U	2U	2U	2U
B1147	9'	07/16/01	2U	2U	2U	2U	2U
B1147	15'	07/16/01	2U	2U	2U	2U	2U
B1148	9'	07/16/01	2U	2U	2U	2U	2U
B1148	15'	07/16/01	2U	2U	2U	2U	2U
B1149	9'	07/16/01	2U	0.1J	2U	2U	2U
B1149	15'	07/16/01	2U	2U	2U	2U	2U

Table 5-7 (continued)
Building 430 Soil-Gas Survey Results
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Sample Depth*	*Date*	*Reported DCE ug/L*	*Reported CCl_4 ug/L*	*Reported TCE ug/L*	*Reported PCE ug/L*	*Reported BTEX ug/L*
B1151	9'	07/17/01	2U	0.1J	2U	2U	2U
B1151	15'	07/17/01	2U	2U	2U	2U	2U
B1152	9'	07/17/01	2U	0.3J	2U	2U	2U
B1152	15'	07/17/01	2U	2U	2U	2U	2U
B1154	9'	07/17/01	2U	2U	2U	2U	2U
B1154	15'	07/17/01	2U	2U	2U	2U	2U
B1155	9'	07/16/01	2U	2U	2U	2U	2U
B1155	15'	07/16/01	2U	0.1J	2U	2U	2U
B1156	9'	07/16/01	2U	2U	2U	2U	2U
B1156	15'	07/16/01	2U	2U	2U	2U	2U
B1158	9'	07/17/01	2U	2U	2U	2U	2U
B1158	15'	07/17/01	2U	2U	2U	2U	2U
B1160	9'	07/17/01	2U	2U	2U	2U	2U
B1160	15'	07/17/01	2U	2U	2U	2U	2U
B1161	9'	07/16/01	2U	2U	2U	2U	2U
B1161	15'	07/16/01	2U	2U	2U	2U	2U
B1161 Dup	15'	07/16/01	2U	2U	2U	2U	2U
B1163	9'	07/17/01	2U	2U	2U	2U	2U
B1163	15'	07/17/01	2U	2U	2U	2U	2U
B1164	9'	07/17/01	2U	2U	2U	2U	2U
B1164	15'	07/17/01	2U	2U	2U	2U	2U
B1164 Dup	15'	07/17/01	2U	2U	2U	2U	2U
B7683	9'	07/17/01	2U	2U	2U	2U	2U
B7683	15'	07/17/01	2U	2U	2U	2U	2U
B7684	9'	07/17/01	2U	2U	2U	2U	2U
B7684	15'	07/17/01	2U	2U	2U	2U	2U
B7684 Dup	15'	07/17/01	2U	2U	2U	2U	2U

Notes:

All values rounded to two signifcant digits (one if less than 1.0 ug/L).

BTEX - Benzene, Toluene, Ethylbenzene, meta-, para- and ortho-Xylene

CCl_4 - Carbon Tetrachloride

DCE - cis-1,2-Dichloroethene

J - Estimated value below the reporting limit

mg/L - micrograms per liter

PCE - Tetrachloroethene

TCE - Trichloroethene

U - Undetected by EPS

Table 5-8
Building 430 Soil-Sampling Results
Locations B887S - B943S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B887S/SB01	B887S/SB02	B887S/SB03	B887S/SB04	B887S/SB11	B888S/SB01
			Date Sampled:	11/14/2001	11/14/2001	11/14/2001	11/14/2001	11/14/2001	11/13/2001
			Sample Depth From:	0	1	4	7	7	0
			Sample Depth To:	1	4	7	10	10	1
			Laboratory Number:	01111090	01111091	01111092	01111093	01111094 Duplicate	01110996
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Benzo(a)anthracene	mg/kg	12	10	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.05**
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.05**
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.06**
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.05**
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.03**
Chrysene	mg/kg	6.4	6.4	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.05**
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	**0.09**
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.03**
Phenanthrene	mg/kg	--	--	0.06 U	0.06 U	0.05 U	0.05 U	0.05 U	**0.07**
Pyrene	mg/kg	140	140	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	**0.08**
Volatiles	UNITS								
				ND	ND	ND	ND	ND	ND

Notes:
1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-8 (continued)
Building 430 Soil-Sampling Results
Locations B887S - B943S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B888S/SB02	B888S/SB02	B888S/SB03	B888S/SB04	B901S/SB01	B901S/SB02
			Date Sampled:	11/13/2001	11/13/2001	11/13/2001	11/13/2001	11/15/2001	11/15/2001
			Sample Depth From:	1	1	4	7	0	1
			Sample Depth To:	4	4	7	10	1	4
			Laboratory Number:	01110997	01110997R Re-analysis	01110998	01110999	01111237	01111238
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Benzo(a)anthracene	mg/kg	12	10	0.01 UJ	0.01 UR	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	0.01 UJ	0.01 UR	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	0.01 UJ	0.01 UR	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 UJ	0.01 UR	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 UJ	0.01 UR	0.01 U	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 UJ	0.01 UR	0.01 U	0.01 U	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 UJ	0.01 UR	0.01 U	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	0.02 UJ	0.02 UR	0.02 U	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 UJ	0.01 UR	0.01 U	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	--	--	0.06 UJ	0.06 UR	0.06 U	0.05 U	0.06 U	0.06 U
Pyrene	mg/kg	140	140	0.02 UJ	0.02 UR	0.02 U	0.02 U	0.02 U	0.02 U
Volatiles	UNITS								
				ND	NA	ND	ND	ND	ND

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-8 (continued)
Building 430 Soil-Sampling Results
Locations B887S - B943S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Point:				B901S/SB03	B901S/SB04	B902S/SB01	B902S/SB02	B902S/SB11	B902S/SB03
Date Sampled:				11/15/2001	11/15/2001	11/13/2001	11/13/2001	11/13/2001	11/13/2001
Sample Depth From:				4	7	0	1	1	4
Sample Depth To:				7	10	1	4	4	7
Laboratory Number:				01111239	01111240	01110991	01110992	01110995 Duplicate	01110993
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Benzo(a)anthracene	mg/kg	12	10	0.01 U	0.01 U	**0.03**	0.01 U	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	0.01 U	**0.03**	0.01 U	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	0.01 U	**0.04**	0.01 U	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U	0.01 U	**0.03**	0.01 U	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U	0.02 U	**0.06**	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	0.01 U	**0.02**	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	--	--	0.06 U	0.05 U	0.06 U	0.06 U	0.06 U	0.06 U
Pyrene	mg/kg	140	140	0.02 U	0.02 U	**0.04**	0.02 U	0.02 U	0.02 U
Volatiles	UNITS								
				ND	ND	ND	ND	ND	ND

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-8 (continued)
Building 430 Soil-Sampling Results
Locations B887S - B943S

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Fort Riley, Kansas

			Sample Point:	B902S/SB04	B916S/SB01	B916S/SB01	B916S/SB02	B916S/SB03	B916S/SB11
			Date Sampled:	11/13/2001	11/14/2001	11/14/2001	11/14/2001	11/14/2001	11/14/2001
			Sample Depth From:	7	0	0	1	4	4
			Sample Depth To:	10	1	1	4	7	7
			Laboratory Number:	01110994	01111079	01111079R Re-analysis	01111080	01111081	01111083 Duplicate
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Benzo(a)anthracene	mg/kg	12	10	0.01 U	**0.12 J**	0.16 R	0.01 U	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	**0.1 J**	0.16 R	0.01 U	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	**0.12 J**	0.16 R	0.01 U	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	**0.09 J**	0.12 R	0.01 U	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	**0.06 J**	0.08 R	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U	**0.13 J**	0.17 R	0.01 U	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	**0.02 J**	0.03 R	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U	**0.29 J**	0.32 R	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	**0.07 J**	0.1 R	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	--	--	0.05 U	**0.19 J**	0.23 R	0.06 U	0.06 U	0.06 U
Pyrene	mg/kg	140	140	0.02 U	**0.21 J**	0.26 R	0.02 U	0.02 U	0.02 U
Volatiles	UNITS								
				ND	ND	NA	ND	ND	ND

Notes:

1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-8 (continued)
Building 430 Soil-Sampling Results
Locations B887S - B943S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B916S/SB04	B918S/SB01	B918S/SB02	B918S/SB03	B918S/SB04	B918S/SB11
			Date Sampled:	11/14/2001	11/12/2001	11/12/2001	11/12/2001	11/12/2001	11/12/2001
			Sample Depth From:	7	0	1	4	7	7
			Sample Depth To:	10	1	4	7	10	10
			Laboratory Number:	01111082	01110901	01110902	01110903	01110904	01110905 Duplicate
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Benzo(a)anthracene	mg/kg	12	10	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	--	--	0.05 U	0.06 U	0.06 U	0.06 U	0.05 U	0.05 U
Pyrene	mg/kg	140	140	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Volatiles	UNITS								
				ND	ND	ND	ND	ND	ND

Notes:
1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-8 (continued)
Building 430 Soil-Sampling Results
Locations B887S - B943S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B925S/SB01	B925S/SB02	B925S/SB02	B925S/SB03	B925S/SB04	B934S/SB01
			Date Sampled:	11/15/2001	11/15/2001	11/15/2001	11/15/2001	11/15/2001	11/19/2001
			Sample Depth From:	0	1	1	4	7	0
			Sample Depth To:	1	4	4	7	10	1
			Laboratory Number:	01111241	01111242	01111242R Re-analysis	01111243	01111244	01111586
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Benzo(a)anthracene	mg/kg	12	10	0.01 U	0.01 UJ	0.01 UR	0.01 U	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	0.01 UJ	0.01 UR	0.01 U	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	0.01 UJ	0.01 UR	0.01 U	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	0.01 UJ	0.01 UR	0.01 U	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	0.01 UJ	0.01 UR	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U	0.01 UJ	0.01 UR	0.01 U	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	0.01 UJ	0.01 UR	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U	0.02 UJ	0.02 UR	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	0.01 UJ	0.01 UR	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	--	--	0.06 U	0.06 UJ	0.06 UR	0.05 U	0.05 U	0.06 U
Pyrene	mg/kg	140	140	0.02 U	0.02 UJ	0.02 UR	0.02 U	0.02 U	0.02 U
Volatiles	UNITS								
				ND	ND	NA	ND	ND	ND

Notes:
1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-8 (continued)
Building 430 Soil-Sampling Results
Locations B887S - B943S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B934S/SB02	B934S/SB03	B934S/SB04	B943S/SB01	B943S/SB02	B943S/SB03
			Date Sampled:	11/19/2001	11/19/2001	11/19/2001	11/14/2001	11/14/2001	11/14/2001
			Sample Depth From:	1	4	7	0	1	4
			Sample Depth To:	4	7	10	1	4	7
			Laboratory Number:	01111587	01111588	01111589	01111085	01111086	01111087
		RSK Soil Pathway	RSK Soil to GW Pathway						
PAHs	UNITS								
Benzo(a)anthracene	mg/kg	12	10	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenanthrene	mg/kg	--	--	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Pyrene	mg/kg	140	140	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Volatiles	UNITS								
				ND	ND	ND	ND	ND	ND

Notes:
1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-8 (continued)
Building 430 Soil-Sampling Results
Locations B887S - B943S
354 Area Solvent Detections RI Report
Fort Riley, Kansas

			Sample Point:	B943S/SB11	B943S/SB04
			Date Sampled:	11/14/2001	11/14/2001
			Sample Depth From:	4	7
			Sample Depth To:	7	10
			Laboratory Number:	01111089 Duplicate	01111088
		RSK Soil Pathway	RSK Soil to GW Pathway		
PAHs	UNITS				
Benzo(a)anthracene	mg/kg	12	10	0.01 U	0.01 U
Benzo(a)pyrene	mg/kg	1.2	16	0.01 U	0.01 U
Benzo(b)fluoranthene	mg/kg	12	19	0.01 U	0.01 U
Benzo(g,h,i)perylene	mg/kg	--	--	0.01 U	0.01 U
Benzo(k)fluoranthene	mg/kg	10	10	0.01 U	0.01 U
Chrysene	mg/kg	6.4	6.4	0.01 U	0.01 U
Dibenz(a,h)anthracene	mg/kg	1.2	3.1	0.01 U	0.01 U
Fluoranthene	mg/kg	220	220	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.76	0.76	0.01 U	0.01 U
Phenanthrene	mg/kg	--	--	0.05 U	0.05 U
Pyrene	mg/kg	140	140	0.02 U	0.02 U
Volatiles	UNITS				
				ND	ND

Notes:
1. Analytical results compared to Kansas Risk-Based Standards (RSK) for both the soil pathway and the soil to groundwater protection pathway (residential scenario).
2. All positive detections are in **bold.**

-- No regulatory value available
mg/kg - milligrams per kilogram
J - Qualified as estimated
NA - Not Analysed
OVERCAL - Concentration exceeded calibration of instrument
PAH - Polycyclic Aromatic Hydrocarbon
R - Rejected
U - Compound was not detected

Table 5-9a
Groundwater Data (Positive Detections Only)
Monitoring Well TSO292-01
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NS	***0.8***	***3.5***	***3.2***	***4.2***	***0.9***	***3***	0.4 U	0.4 U	***0.4***
Bromodichloromethane	ug/L	100 (Note 1)	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NS	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NS	***0.7***	***2***	***1.2***	***1.1***	***1.3***	***0.9***	***0.7***	***1***	***0.8***
Chloroform	ug/L	100 (Note 1)	NS	***0.7***	***1.4***	***1.1***	***1.1***	***1.2***	***0.9***	***0.7***	***0.9***	***1***
cis-1,2-Dichloroethene	ug/L	70	NS	0.5 U	***0.5***	***0.6***	***1***	***0.7***	***0.8***	0.5 U	0.5 U	***1.8***
Dibromochloromethane	ug/L	100 (Note 1)	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NS	***0.7***	***5.1***	***2.4***	***2.9***	0.7 U	***1.3***	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NS	***1.6***	***12.3***	***8***	***5.7***	***2***	***4.8***	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NS	0.6 U	***1.3***	***1.2***	***1.1***	***0.6***	***0.9***	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NS	***19.4***	***69.3***	***75.9***	***56.8***	***66.5***	***44.2***	***27.9***	***33***	***39***
Toluene	ug/L	1,000	NS	***0.4***	***2.4***	***1***	***1.2***	0.4 U	***1.8***	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NS	***1.9***	***3.2***	***3.3***	***3.6***	***3.6***	***2.7***	***2.2***	***2.2***	***2.7***
Vinyl Chloride	ug/L	2	NS	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NS	10 U	10 U	10 U	10 U	10 U	10 U	***19***	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NS	NA	NA	NA	NA	NA	***30***	2 U	***22***	2 U
Inorganics	UNITS											
Alkalinity	mg/L	---	NS	NA	NA	NA	NA	NA	***369***	***338***	***354***	***346***
Chloride	mg/L	250 (Note 4)	NS	NA	NA	NA	NA	NA	***180***	***180***	***170***	***170***
Nitrate	mg/L	10	NS	NA	NA	NA	NA	NA	***10.8***	***12.3***	***12.4***	***9.8***
Sulfate	mg/L	250 (Note 4)	NS	NA	NA	NA	NA	NA	***110***	***120***	***120***	***110***
Sulfide	mg/L	---	NS	NA	NA	NA	NA	NA	0.1 U	0.1 UR	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NS	NA	NA	NA	NA	NA	***2.2***	***3.2***	***2.3***	***3.5***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NS	0.005 U	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	NS	***0.2***	NA	NA	NA	NA	***0.16***	***0.16***	***0.16***	***0.18***
Chromium, Total	mg/L	0.1	NS	0.002 U	NA	NA	NA	NA	***0.002***	***0.002***	***0.003***	0.002 U
Lead, Total	mg/L	0.015	NS	0.003 U	NA	NA	NA	NA	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NS	0.0002 U	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:
J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9b
Groundwater Data (Positive Detections Only)
Monitoring Well TSO292-02
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	ND	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	***25.1***	***18.3***	***14.6***	***17.5***	***25.3***	***15.9***	***17.8***	***31***	***37.4***	***40.3***
Bromodichloromethane	ug/L	100 (Note 1)	ND	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	ND	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	ND	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	ND	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	***21.8***	***7.7***	***10***	***10.8***	***14.1***	***14***	***15.6***	***19.2***	***16.4***	***18***
Dibromochloromethane	ug/L	100 (Note 1)	ND	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	ND	***1***	0.7 U	***1.4***	***3.1***	***2***	***1.5***	***3.8***	***8.5***	***3.6***
m,p-Xylene	ug/L	10,000 (Note 2)	ND	***1.9***	***1.5***	***2.2***	***3.7***	***3.5***	0.6 U	***4.2***	***8.7***	***5.5***
o-Xylene	ug/L	10,000 (Note 2)	ND	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	***0.7***	***1.2***	***0.7***
Tetrachloroethylene	ug/L	5	5 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	ND	***1.2***	***1***	***0.9***	***1.7***	***1.1***	***1.1***	***2.1***	***2.7***	***2.2***
trans-1,2-Dichloroethene	ug/L	100	ND	***0.6***	***0.6***	***0.7***	***0.6***	***0.7***	***1.7***	***1***	***0.8***	***0.7***
Trichloroethylene	ug/L	5	ND	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	ND	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NA	NA	NA	NA	NA	NA	*304 R*	***270***	***189***	***387***
Inorganics	UNITS											
Alkalinity	mg/L	---	NA	NA	NA	NA	NA	NA	***499***	***501***	***559***	***504***
Chloride	mg/L	250 (Note 4)	NA	NA	NA	NA	NA	NA	***180***	***170***	***190***	***190***
Nitrate	mg/L	10	NA	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Sulfate	mg/L	250 (Note 4)	NA	NA	NA	NA	NA	NA	***7***	1 U	***2***	***1***
Sulfide	mg/L	---	NA	NA	NA	NA	NA	NA	0.1 U	0.1 UR	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NA	NA	NA	NA	NA	NA	***7.8***	***5.6***	***8.4***	***7***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	***0.0645***	***0.116***	NA	NA	NA	NA	***0.09***	***0.025***	***0.021***	***0.033***
Barium, Total	mg/L	2	***1.07***	***1***	NA	NA	NA	NA	***1***	***1.05***	***1.05***	***0.95***
Chromium, Total	mg/L	0.1	0.005 U	0.002 U	NA	NA	NA	NA	0.002 U	***0.002***	***0.002***	0.002 U
Lead, Total	mg/L	0.015	0.002 U	0.003 U	NA	NA	NA	NA	0.003 U	***0.004***	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	0.0002 U	0.0002 U	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

September 1997 groundwater samples were analyzed at ITS Laboratories. The validity of this data is questionable, but it is included here for completeness.

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9c
Groundwater Data (Positive Detections Only)
Monitoring Well MW95-03
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NS	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	***1***
Bromodichloromethane	ug/L	100 (Note 1)	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NS	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NS	***7***	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	ug/L	100 (Note 1)	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NS	***1.7***	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NS	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NS	***2.7***	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NS	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NS	NA	NA	NA	NA	NA	***11***	***9***	***3***	***12***
Inorganics	UNITS											
Alkalinity	mg/L	---	NS	NA	NA	NA	NA	NA	***531***	***490***	***520***	***512***
Chloride	mg/L	250 (Note 4)	NS	NA	NA	NA	NA	NA	***170***	***230***	***280***	***250***
Nitrate	mg/L	10	NS	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Sulfate	mg/L	250 (Note 4)	NS	NA	NA	NA	NA	NA	***66***	***130***	***190***	***83***
Sulfide	mg/L	---	NS	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NS	NA	NA	NA	NA	NA	***2.7***	***3.3***	***6.1***	***4.4***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NS	***0.016***	NA	NA	NA	NA	***0.029***	***0.026***	***0.026***	***0.045***
Barium, Total	mg/L	2	NS	***0.2***	NA	NA	NA	NA	***0.22***	***0.23***	***0.25***	***0.28***
Chromium, Total	mg/L	0.1	NS	0.002 U	NA	NA	NA	NA	0.002 U	***0.004***	***0.046***	***0.006***
Lead, Total	mg/L	0.015	NS	0.003 U	NA	NA	NA	NA	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NS	0.0002 U	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.

Detections equal to or exceeding MCLs are shaded.

Table 5-9d
Groundwater Data (Positive Detections Only)
Monitoring Well MW95-04
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	ND	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	ND	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	ND	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	***0.7***	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	ND	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	ND	0.7 U	0.5 U	0.5 U	***0.8***	***1.3***	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	ND	0.5 U	0.6 U	0.6 U	0.5 U	***1***	***0.7***	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	ND	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	ug/L	100 (Note 1)	ND	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	***0.9***	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	ND	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	ND	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	ND	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	ND	***1.2***	1.1 U	***3.9***	***5.3***	***9.6***	***4***	***2.9***	***1.2***	***3.3***
Toluene	ug/L	1,000	ND	0.4 U	0.7 U	0.7 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	ND	0.5 U	0.4 U	0.4 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	ND	0.6 U	0.5 U	0.5 U	***0.7***	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	ND	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NA	NA	NA	NA	NA	NA	2 U	2 U	2 U	2 U
Inorganics	UNITS											
Alkalinity	mg/L	---	NA	NA	NA	NA	NA	NA	***344***	***338***	***225***	***315***
Chloride	mg/L	250 (Note 4)	NA	NA	NA	NA	NA	NA	***110***	***80***	***50***	***80***
Nitrate	mg/L	10	NA	NA	NA	NA	NA	NA	***10.6***	***11.7***	***5.4***	***9.5***
Sulfate	mg/L	250 (Note 4)	NA	NA	NA	NA	NA	NA	***51***	***48***	***26***	***54***
Sulfide	mg/L	---	NA	NA	NA	NA	NA	NA	0.1 U	0.1 UR	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NA	NA	NA	NA	NA	NA	***2.4***	***1.9***	***1.2***	***4.7***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	0.0059 U	0.005 U	NA	NA	NA	NA	0.005 U	***0.005***	0.005 U	0.005 U
Barium, Total	mg/L	2	***0.238***	***0.2***	NA	NA	NA	NA	***0.31***	***0.24***	***0.17***	***0.26***
Chromium, Total	mg/L	0.1	***0.0024 J***	0.002 U	NA	NA	NA	NA	0.002 U	0.002 U	***0.005***	***0.002***
Lead, Total	mg/L	0.015	***0.0021***	***0.006***	NA	NA	NA	NA	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	0.0002 U	0.0002 U	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

September 1997 groundwater samples were analyzed at ITS Laboratories. The validity of this data is questionable, but it is included here for completeness.

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.

Detections equal to or exceeding MCLs are shaded.

Table 5-9e
Groundwater Data (Positive Detections Only)
Monitoring Well MW95-06
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	ND	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	ND	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	ND	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	ND	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	ND	***5.3***	***2.3***	***3***	***2.2***	***2.4***	***2.3***	***1.6***	***2.4***	***1.5***
Chloroform	ug/L	100 (Note 1)	ND	***2.2***	***1.1***	***1.6***	***1.4***	***1.5***	***1.1***	***0.9***	***1.4***	***0.9***
cis-1,2-Dichloroethene	ug/L	70	ND	0.5 U	***0.7***	***1***	***0.8***	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	ug/L	100 (Note 1)	ND	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	ND	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	ND	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	ND	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	***47.4***	***51.8***	***82***	***99.6***	***95.2***	***75.8***	***55.5***	***47.2***	***58.2***	***70***
Toluene	ug/L	1,000	ND	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	ND	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	ND	***1.4***	***2.2***	***2.4***	***2.8***	***2.2***	***1.7***	***1.3***	***1.4***	***1.5***
Vinyl Chloride	ug/L	2	ND	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NA	NA	NA	NA	NA	NA	2 U	2 U	2 U	2 U
Inorganics	UNITS											
Alkalinity	mg/L	---	NA	NA	NA	NA	NA	NA	***337***	***320***	***323***	***294***
Chloride	mg/L	250 (Note 4)	NA	NA	NA	NA	NA	NA	***170***	***140***	***140***	***160***
Nitrate	mg/L	10	NA	NA	NA	NA	NA	NA	***12.8***	***12***	***9.9***	***11***
Sulfate	mg/L	250 (Note 4)	NA	NA	NA	NA	NA	NA	***100***	***110***	***100***	***100***
Sulfide	mg/L	---	NA	NA	NA	NA	NA	NA	0.1 U	0.1 UR	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NA	NA	NA	NA	NA	NA	***1.7***	***1.5***	***2.4***	***0.8***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	0.01 UR	0.005 U	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	***0.18***	***0.2***	NA	NA	NA	NA	***0.18***	***0.18***	***0.18***	***0.17***
Chromium, Total	mg/L	0.1	***0.0023 J***	0.002 U	NA	NA	NA	NA	0.002 U	0.002 U	***0.002***	0.002 U
Lead, Total	mg/L	0.015	0.002 UR	0.003 U	NA	NA	NA	NA	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	0.0002 U	0.0002 U	NA	NA	NA	NA	0.0002 U	0.0002 U	***0.0002***	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

September 1997 groundwater samples were analyzed at ITS Laboratories. The validity of this data is questionable, but it is included here for completeness.

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9f
Groundwater Data (Positive Detections Only)
Monitoring Well B354-99-07
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	0.7 U	***2***	***3***	***3.1***	***3***	***2.9***	***2.9***	***2.2***
Chloroform	ug/L	100 (Note 1)	NI	NI	0.5 U	***0.9***	***1***	***1.2***	***1.2***	***1.1***	***1.1***	***0.9***
cis-1,2-Dichloroethene	ug/L	70	NI	NI	0.5 U	0.5 U	0.5 U	***0.6***	0.5 U	0.5 U	***0.5***	0.5U
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	***44.4***	***58.1***	***61.1***	***87.2***	***71.6***	***75.8***	***86.9***	***64.3***
Toluene	ug/L	1,000	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	0.6 U	***0.8***	***1.1***	***1.6***	***1.3***	***1.4***	***1.6***	***1.2***
Vinyl Chloride	ug/L	2	NI	NI	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NA	NA	NA	NA	2 U	2 U	2 U	4 U
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NA	NA	NA	NA	***326***	***323***	***358***	***322***
Chloride	mg/L	250 (Note 4)	NI	NI	NA	NA	NA	NA	***80***	***60***	***70***	***80***
Nitrate	mg/L	10	NI	NI	NA	NA	NA	NA	***10.8***	***10.8***	***11.3***	***11.3***
Sulfate	mg/L	250 (Note 4)	NI	NI	NA	NA	NA	NA	***120***	***100***	***110***	***120***
Sulfide	mg/L	---	NI	NI	NA	NA	NA	NA	0.1 U	0.1 UR	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NA	NA	NA	NA	***1.7***	***1.4***	***1.6***	***6.1***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	NI	NI	NA	NA	NA	NA	***0.12***	***0.12***	***0.13***	***0.13***
Chromium, Total	mg/L	0.1	NI	NI	NA	NA	NA	NA	0.002 U	***0.002***	***0.003***	0.002 U
Lead, Total	mg/L	0.015	NI	NI	NA	NA	NA	NA	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9g
Groundwater Data (Positive Detections Only)
Monitoring Well B354-99-08
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	60 U	10 U	0.6 U	***0.7***	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	40 U	8 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	50 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	500 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	70 U	10 U	***2.7***	***3.5***	***2.6***	***2.9***	***3.6***	***3.8***
Chloroform	ug/L	100 (Note 1)	NI	NI	50 U	10 U	***1.4***	***2.2***	***2.2***	***1.5***	***2***	***2***
cis-1,2-Dichloroethene	ug/L	70	NI	NI	***260***	***94***	***41***	***98***	***150***	***104***	***58.6***	***72***
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	70 U	10 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	70 U	10 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	60 U	10 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	60 U	10 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	***4,630***	***1,480***	***970***	***1,570***	***1,640***	***928***	***455***	***404***
Toluene	ug/L	1,000	NI	NI	40 U	8 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	50 U	10 U	***0.6***	***1.3***	***1.6***	***1***	***0.6***	***0.7***
Trichloroethylene	ug/L	5	NI	NI	***160***	***46***	***27***	***52***	***65.1***	***39.9***	***24***	***24.1***
Vinyl Chloride	ug/L	2	NI	NI	80 U	20 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NA	NA	NA	NA	2 U	2 U	2 U	2 U
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NA	NA	NA	NA	***386***	***339***	***380***	***317***
Chloride	mg/L	250 (Note 4)	NI	NI	NA	NA	NA	NA	***110***	***120***	***140***	***140***
Nitrate	mg/L	10	NI	NI	NA	NA	NA	NA	***6***	***6.8***	***5.6***	***6.8***
Sulfate	mg/L	250 (Note 4)	NI	NI	NA	NA	NA	NA	***190***	***170***	***130***	***140***
Sulfide	mg/L	---	NI	NI	NA	NA	NA	NA	0.1 U	0.1 UR	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NA	NA	NA	NA	***1.7***	***1.8***	***1.5***	***1.7***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	NI	NI	NA	NA	NA	NA	0.1 U	0.1 UR	***0.11***	***0.11***
Chromium, Total	mg/L	0.1	NI	NI	NA	NA	NA	NA	***0.002***	***0.004***	***0.003***	0.002 U
Lead, Total	mg/L	0.015	NI	NI	NA	NA	NA	NA	0.003 U	.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.

Detections equal to or exceeding MCLs are shaded.

Table 5-9h
Groundwater Data (Positive Detections Only)
Monitoring Well B354-99-09
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	***0.7***	***1.1***	***1.6***	***2***	***1.8***	***1.6***	***1***	***1***
Chloroform	ug/L	100 (Note 1)	NI	NI	***0.5***	***0.7***	***0.8***	***0.9***	***0.9***	0.9 U	***0.7***	***0.7***
cis-1,2-Dichloroethene	ug/L	70	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	***25.1***	***96.8***	***76.6***	***53.2***	***58.2***	***52.5***	***30.3***	***27.5***
Toluene	ug/L	1,000	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	0.6 U	***1.4***	***1.2***	***1***	***1.1***	***1***	***0.7***	0.6 U
Vinyl Chloride	ug/L	2	NI	NI	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	10 U	10 U	10 U	10 U	10 U	10 U	10 U	***63***
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NA	NA	NA	NA	2 U	2 U	2 U	2 U
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NA	NA	NA	NA	***286***	***284***	***315***	***283***
Chloride	mg/L	250 (Note 4)	NI	NI	NA	NA	NA	NA	***270***	***250***	***290***	***300***
Nitrate	mg/L	10	NI	NI	NA	NA	NA	NA	***27***	***25***	***29***	***34***
Sulfate	mg/L	250 (Note 4)	NI	NI	NA	NA	NA	NA	***130***	***130***	***140***	***170***
Sulfide	mg/L	---	NI	NI	NA	NA	NA	NA	0.1 U	0.1 UR	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NA	NA	NA	NA	***1.3***	***1.5***	***1.4***	***1.8***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	NI	NI	NA	NA	NA	NA	***0.14***	***0.13***	***0.16***	***0.16***
Chromium, Total	mg/L	0.1	NI	NI	NA	NA	NA	NA	0.002 U	0.002 U	***0.003***	0.002 U
Lead, Total	mg/L	0.015	NI	NI	NA	NA	NA	NA	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9i
Groundwater Data (Positive Detections Only)
Monitoring Well B354-00-10
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	***7.2***	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	***0.7***
cis-1,2-Dichloroethene	ug/L	70	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NI	NI	***0.8***	***2.5***	***0.9***	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NA	NA	NA	NA	***3***	***5***	***5***	***4***
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NA	NA	NA	NA	***211***	***219***	***239***	***215***
Chloride	mg/L	250 (Note 4)	NI	NI	NA	NA	NA	NA	***11***	***11***	***10***	***10***
Nitrate	mg/L	10	NI	NI	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Sulfate	mg/L	250 (Note 4)	NI	NI	NA	NA	NA	NA	***650***	***610***	***620***	***640***
Sulfide	mg/L	---	NI	NI	NA	NA	NA	NA	0.1 U	0.1 UR	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NA	NA	NA	NA	0.5 U	***0.6***	0.5 U	0.5 U
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	NI	NI	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Chromium, Total	mg/L	0.1	NI	NI	NA	NA	NA	NA	0.002 U	0.002 U	0.002 U	0.002 U
Lead, Total	mg/L	0.015	NI	NI	NA	NA	NA	NA	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:
J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9j
Groundwater Data (Positive Detections Only)
Monitoring Well B354-99-12
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NI	NI	0.5	***1.4***	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NI	NI	***2.2***	***2***	***2.5***	***3.7***	***3.6***	***2.6***	***2.5***	***3.1***
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	1.1 U	1.1 U	1.1 U	1.1 U	***1.4***	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	***1.3***	0.5 U	***1.3***	***1.6***	***1.2***	***1***	***1***	***1***
Vinyl Chloride	ug/L	2	NI	NI	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NA	NA	NA	NA	2 U	2 U	2 U	2 U
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NA	NA	NA	NA	***445***	***462***	***468***	***494***
Chloride	mg/L	250 (Note 4)	NI	NI	NA	NA	NA	NA	***130***	***130***	***130***	***130***
Nitrate	mg/L	10	NI	NI	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Sulfate	mg/L	250 (Note 4)	NI	NI	NA	NA	NA	NA	***140***	***130***	***150***	***150***
Sulfide	mg/L	---	NI	NI	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NA	NA	NA	NA	***2.3***	***2.7***	***2.7***	***2.9***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	NI	NI	NA	NA	NA	NA	***0.11***	***0.12***	***0.11***	***0.11***
Chromium, Total	mg/L	0.1	NI	NI	NA	NA	NA	NA	0.002 U	***0.003***	0.002 U	0.002 U
Lead, Total	mg/L	0.015	NI	NI	NA	NA	NA	NA	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9k
Groundwater Data (Positive Detections Only)
Monitoring Well B354-99-12b
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NI	NI	***7.7***	***8.4***	***7.9***	***6.6***	***6.8***	***6.8***	***5.9***	***5.7 J***
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	0.5 U	***0.5***	0.5 U	***0.5***	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	***0.8***	***0.8***	***0.7***	***1.3***	***0.9***	***1***	***0.6***	***1.2***
Vinyl Chloride	ug/L	2	NI	NI	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NA	NA	NA	NA	2 U	2 U	***10***	***3***
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NA	NA	NA	NA	***402***	***381***	***441***	***427***
Chloride	mg/L	250 (Note 4)	NI	NI	NA	NA	NA	NA	***230***	***200***	***180***	***210***
Nitrate	mg/L	10	NI	NI	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Sulfate	mg/L	250 (Note 4)	NI	NI	NA	NA	NA	NA	***180***	***160***	***170***	***170***
Sulfide	mg/L	---	NI	NI	NA	NA	NA	NA	0.1 U	0.1 UR	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NA	NA	NA	NA	***1.7***	***2.5***	***2.1***	***2.1***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NA	NA	NA	NA	***0.007***	***0.01***	***0.006***	***0.008***
Barium, Total	mg/L	2	NI	NI	NA	NA	NA	NA	***0.14***	***0.18***	***0.13***	***0.12***
Chromium, Total	mg/L	0.1	NI	NI	NA	NA	NA	NA	0.002 U	0.002 U	0.002 U	0.002 U
Lead, Total	mg/L	0.015	NI	NI	NA	NA	NA	NA	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.

Detections equal to or exceeding MCLs are shaded.

Table 5-9l
Groundwater Data (Positive Detections Only)
Monitoring Well B354-99-12c
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NI	NI	***7***	***7.7***	***7.3***	***6.4***	***6.8***	***5.7***	***5.9***	***5.7 J***
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	0.5 U	0.5 U	0.5 U	***0.5***	***0.5***	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	***0.8***	***0.8***	***0.7***	***1.8***	***0.9***	***0.8***	***1.5***	***1.9***
Vinyl Chloride	ug/L	2	NI	NI	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NA	NA	NA	NA	2 U	***9***	***2 U***	2 UJ
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NA	NA	NA	NA	***403***	***422***	***409***	***432***
Chloride	mg/L	250 (Note 4)	NI	NI	NA	NA	NA	NA	***240***	***160***	***210***	***240***
Nitrate	mg/L	10	NI	NI	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Sulfate	mg/L	250 (Note 4)	NI	NI	NA	NA	NA	NA	***170***	***150***	***160***	***170***
Sulfide	mg/L	---	NI	NI	NA	NA	NA	NA	0.1 U	0.1 UR	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NA	NA	NA	NA	***1.6***	***3.3***	***1.9***	***1.6***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NA	NA	NA	NA	***0.011***	***0.009***	***0.01***	***0.012***
Barium, Total	mg/L	2	NI	NI	NA	NA	NA	NA	***0.2***	***0.12***	***0.19***	***0.2***
Chromium, Total	mg/L	0.1	NI	NI	NA	NA	NA	NA	***0.002***	***0.003***	0.002 U	0.002 U
Lead, Total	mg/L	0.015	NI	NI	NA	NA	NA	NA	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9m
Groundwater Data (Positive Detections Only)
Monitoring Well B354-99-13b
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NI	NI	0.5 U	***0.9***	***1.4***	***1.4***	***1.5***	***2.5***	***2.1***	***2.3***
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NI	NI	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NA	NA	NA	NA	***7***	***16***	***18***	***8***
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NA	NA	NA	NA	***499***	***441***	***491***	***442***
Chloride	mg/L	250 (Note 4)	NI	NI	NA	NA	NA	NA	***100***	***100***	***100***	***100***
Nitrate	mg/L	10	NI	NI	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Sulfate	mg/L	250 (Note 4)	NI	NI	NA	NA	NA	NA	***180***	***160***	***150***	***140***
Sulfide	mg/L	---	NI	NI	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NA	NA	NA	NA	***4***	***3.3***	***3.4***	***4.2***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NA	NA	NA	NA	***0.007***	***0.038***	***0.034***	***0.036***
Barium, Total	mg/L	2	NI	NI	NA	NA	NA	NA	***0.14***	***0.18***	***0.2***	***0.17***
Chromium, Total	mg/L	0.1	NI	NI	NA	NA	NA	NA	0.002 U	***0.002***	0.002 U	0.002 U
Lead, Total	mg/L	0.015	NI	NI	NA	NA	NA	NA	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:
J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9n
Groundwater Data (Positive Detections Only)
Monitoring Well B354-99-13c
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NI	NI	***4.3***	***4.8***	***5.3***	***3.9***	***3.4***	***3.3***	***3.3***	***3.2***
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NI	NI	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NA	NA	NA	NA	***5***	***6***	***4***	***6***
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NA	NA	NA	NA	***398***	***366***	***419***	***371***
Chloride	mg/L	250 (Note 4)	NI	NI	NA	NA	NA	NA	***120***	***120***	***100***	***100***
Nitrate	mg/L	10	NI	NI	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Sulfate	mg/L	250 (Note 4)	NI	NI	NA	NA	NA	NA	***130***	***100***	***110***	***120***
Sulfide	mg/L	---	NI	NI	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NA	NA	NA	NA	***2.2***	***1.8***	***1.9***	***1.7***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NA	NA	NA	NA	***0.052***	***0.051***	***0.058***	***0.047***
Barium, Total	mg/L	2	NI	NI	NA	NA	NA	NA	***0.26***	***0.29***	***0.3***	***0.25***
Chromium, Total	mg/L	0.1	NI	NI	NA	NA	NA	NA	0.002 U	***0.003***	0.002 U	0.002 U
Lead, Total	mg/L	0.015	NI	NI	NA	NA	NA	NA	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9o
Groundwater Data (Positive Detections Only)
Monitoring Well B354-00-PZ14c
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	NS	NS	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	NS	NS	NS	NS	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	NS	NS	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	NS	NS	NS	NS	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	NS	NS	NS	NS	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NI	NI	NS	NS	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NI	NI	NS	NS	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	NS	NS	NS	NS	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	NS	NS	NS	NS	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	NS	NS	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	NS	NS	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	NS	NS	NS	NS	1.1 U	***1.2***	1.1 U	1.1 U
Toluene	ug/L	1,000	NI	NI	NS	NS	NS	NS	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	NS	NS	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	NS	NS	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NI	NI	NS	NS	NS	NS	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	NS	NS	NS	NS	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	NS	NS	NS	NS	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NS	NS	NS	NS	***12***	***13***	***46***	***31***
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NS	NS	NS	NS	***502***	***487***	***520***	***504***
Chloride	mg/L	250 (Note 4)	NI	NI	NS	NS	NS	NS	***70***	***70***	***70***	***80***
Nitrate	mg/L	10	NI	NI	NS	NS	NS	NS	0.1 UJ	0.1 U	0.1 U	0.1 U
Sulfate	mg/L	250 (Note 4)	NI	NI	NS	NS	NS	NS	***90***	***100***	***90***	***95***
Sulfide	mg/L	---	NI	NI	NS	NS	NS	NS	0.1 U	0.1 U	0.1 U	***0.4***
Total Organic Carbon	mg/L	---	NI	NI	NS	NS	NS	NS	***4.2***	***2.1***	***4.4***	***2.6***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NS	NS	NS	NS	***0.034***	***0.031***	***0.037***	***0.032***
Barium, Total	mg/L	2	NI	NI	NS	NS	NS	NS	***0.24***	***0.22***	***0.23***	***0.23***
Chromium, Total	mg/L	0.1	NI	NI	NS	NS	NS	NS	***0.004***	***0.002***	0.002 U	0.002 U
Lead, Total	mg/L	0.015	NI	NI	NS	NS	NS	NS	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NS	NS	NS	NS	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.

Detections equal to or exceeding MCLs are shaded.

Table 5-9p
Groundwater Data (Positive Detections Only)
Monitoring Well B354-00-PZ19
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	NS	NS	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	NS	NS	NS	NS	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	NS	NS	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	NS	NS	NS	NS	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	NS	NS	NS	NS	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NI	NI	NS	NS	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NI	NI	NS	NS	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	NS	NS	NS	NS	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	NS	NS	NS	NS	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	NS	NS	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	NS	NS	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	NS	NS	NS	NS	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NI	NI	NS	NS	NS	NS	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	NS	NS	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	NS	NS	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NI	NI	NS	NS	NS	NS	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	NS	NS	NS	NS	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	NS	NS	NS	NS	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NS	NS	NS	NS	2 U	***23***	2U	***50***
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NS	NS	NS	NS	***446***	***397***	***433***	***241***
Chloride	mg/L	250 (Note 4)	NI	NI	NS	NS	NS	NS	***120***	***130***	***110***	***120***
Nitrate	mg/L	10	NI	NI	NS	NS	NS	NS	0.1 UJ	0.1 U	***0.1***	0.1 U
Sulfate	mg/L	250 (Note 4)	NI	NI	NS	NS	NS	NS	***73***	***80***	***76***	***65***
Sulfide	mg/L	---	NI	NI	NS	NS	NS	NS	0.1 U	0.1 U	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NS	NS	NS	NS	3.6 U	***1.9***	***4.3***	***2.5***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NS	NS	NS	NS	0.005 U	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	NI	NI	NS	NS	NS	NS	***0.16***	***0.13***	***0.15***	***0.14***
Chromium, Total	mg/L	0.1	NI	NI	NS	NS	NS	NS	0.002 U	0.002 U	0.002 U	0.002 U
Lead, Total	mg/L	0.015	NI	NI	NS	NS	NS	NS	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NS	NS	NS	NS	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9q
Groundwater Data (Positive Detections Only)
Monitoring Well B354-01-19c
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	NI	NI	NI	NI	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 UJ
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NI	NI	NI	NI	NI	NI	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NI	NI	NI	NI	***30***	***7***	***4***	***3 J***
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NI	NI	NI	NI	***406***	***359***	***409***	***403***
Chloride	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***120***	***140***	***140***	***130***
Nitrate	mg/L	10	NI	NI	NI	NI	NI	NI	0.1	0.1 U	0.1 U	0.1 U
Sulfate	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***80***	***88***	***84***	***88***
Sulfide	mg/L	---	NI	NI	NI	NI	NI	NI	0.1 U	0.1 U	***0.1***	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NI	NI	NI	NI	***1.6***	***2.2***	***3.6***	***1.2***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NI	NI	NI	NI	0.005 U	***0.005***	0.005 U	0.005 U
Barium, Total	mg/L	2	NI	NI	NI	NI	NI	NI	***0.16***	***0.15***	***0.15***	***0.15***
Chromium, Total	mg/L	0.1	NI	NI	NI	NI	NI	NI	***0.003***	***0.004***	0.002 U	0.002 U
Lead, Total	mg/L	0.015	NI	NI	NI	NI	NI	NI	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NI	NI	NI	NI	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:
J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

All analytical results associated with Monitoring Well B354-01-19c, sampled in November, 2001, were rejected by the USACE.

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9r
Groundwater Data (Positive Detections Only)
Monitoring Well B354-00-PZ20
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	NS	NS	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	NS	NS	NS	NS	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	NS	NS	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	NS	NS	NS	NS	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	NS	NS	NS	NS	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NI	NI	NS	NS	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NI	NI	NS	NS	NS	NS	***1.2***	***1.3***	***0.8***	***1.2 J***
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	NS	NS	NS	NS	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	NS	NS	NS	NS	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	NS	NS	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	NS	NS	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	NS	NS	NS	NS	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NI	NI	NS	NS	NS	NS	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	NS	NS	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	NS	NS	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NI	NI	NS	NS	NS	NS	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	NS	NS	NS	NS	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	NS	NS	NS	NS	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NS	NS	NS	NS	2 U	2 U	2 U	2 UJ
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NS	NS	NS	NS	***519***	***510***	***540***	***520***
Chloride	mg/L	250 (Note 4)	NI	NI	NS	NS	NS	NS	***140***	***130***	***140***	***140***
Nitrate	mg/L	10	NI	NI	NS	NS	NS	NS	***0.4***	***0.05***	***0.6***	***0.4 J***
Sulfate	mg/L	250 (Note 4)	NI	NI	NS	NS	NS	NS	***310***	***290***	***300***	***310***
Sulfide	mg/L	---	NI	NI	NS	NS	NS	NS	0.1 U	0.1 U	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NS	NS	NS	NS	***6.1***	***4.7***	***5.9***	***4.3***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NS	NS	NS	NS	0.005 U	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	NI	NI	NS	NS	NS	NS	0.1 U	0.1 U	0.1 U	0.1 U
Chromium, Total	mg/L	0.1	NI	NI	NS	NS	NS	NS	***0.006***	***0.004***	***0.016***	***0.016***
Lead, Total	mg/L	0.015	NI	NI	NS	NS	NS	NS	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NS	NS	NS	NS	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9s
Groundwater Data (Positive Detections Only)
Monitoring Well B354-01-20c
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	NI	NI	NI	NI	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NI	NI	NI	NI	NI	NI	***4***	***3.8***	***3.5***	***4.8 J***
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	***1.2***	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NI	NI	NI	NI	NI	NI	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NI	NI	NI	NI	2 U	***2***	2 U	2 UJ
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NI	NI	NI	NI	***465***	***463***	***480***	***473***
Chloride	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***150***	***160***	***150***	***180***
Nitrate	mg/L	10	NI	NI	NI	NI	NI	NI	***1.8***	***0.7***	***0.4***	0.1 UJ
Sulfate	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***220***	***210***	***190***	***190***
Sulfide	mg/L	---	NI	NI	NI	NI	NI	NI	0.1 U	0.1 U	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NI	NI	NI	NI	***4.8***	***3***	***4.3***	***2.4***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NI	NI	NI	NI	0.005 U	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	NI	NI	NI	NI	NI	NI	***0.13***	***0.13***	***0.12***	***0.14***
Chromium, Total	mg/L	0.1	NI	NI	NI	NI	NI	NI	***0.002***	***0.006***	***0.002***	0.002 U
Lead, Total	mg/L	0.015	NI	NI	NI	NI	NI	NI	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NI	NI	NI	NI	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9t
Groundwater Data (Positive Detections Only)
Monitoring Well B354-01-24
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	NI	NI	NI	NI	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NI	NI	NI	NI	NI	NI	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NI	NI	NI	NI	2 U	2 U	2 U	2 U
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NI	NI	NI	NI	***179***	***149***	***240***	***220***
Chloride	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***34***	***36***	***40***	***34***
Nitrate	mg/L	10	NI	NI	NI	NI	NI	NI	***0.1 J***	***0.1***	***0.2***	***0.2***
Sulfate	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***360***	***380***	***370***	***370***
Sulfide	mg/L	---	NI	NI	NI	NI	NI	NI	0.1 U	0.1 U	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NI	NI	NI	NI	***1.3***	0.5 U	***1.8***	***0.7***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NI	NI	NI	NI	0.005 U	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	NI	NI	NI	NI	NI	NI	0.1 U	0.1 U	0.1 U	0.1 U
Chromium, Total	mg/L	0.1	NI	NI	NI	NI	NI	NI	***0.004***	***0.002***	***0.002***	***0.003***
Lead, Total	mg/L	0.015	NI	NI	NI	NI	NI	NI	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NI	NI	NI	NI	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9u
Groundwater Data (Positive Detections Only)
Monitoring Well B354-01-25
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	NI	NI	NI	NI	***0.4***	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	NI	NI	NI	NI	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	ug/L	700	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	***1.3***	***4.2***	***3.1***	1.1U
Toluene	ug/L	1,000	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NI	NI	NI	NI	NI	NI	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NI	NI	NI	NI	***15***	***131***	***179***	***40***
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NI	NI	NI	NI	***389***	***374***	***429***	***372***
Chloride	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***610***	***700***	***700***	***600***
Nitrate	mg/L	10	NI	NI	NI	NI	NI	NI	***4.2 J***	***14.8***	***13.7***	***1.9***
Sulfate	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***250***	***230***	***210***	***230***
Sulfide	mg/L	---	NI	NI	NI	NI	NI	NI	0.1 U	0.1 U	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NI	NI	NI	NI	***3.3***	***2.7***	***3.1***	***2.7***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NI	NI	NI	NI	0.005 U	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	NI	NI	NI	NI	NI	NI	***0.11***	***0.14***	***0.15***	***0.14***
Chromium, Total	mg/L	0.1	NI	NI	NI	NI	NI	NI	***0.004***	***0.002***	0.002U	0.002U
Lead, Total	mg/L	0.015	NI	NI	NI	NI	NI	NI	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NI	NI	NI	NI	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9v
Groundwater Data (Positive Detections Only)
Monitoring Well B354-01-26
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	NI	NI	NI	NI	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	NI	NI	NI	NI	***2.2***	***3.2***	***1.9***	***3.8***
Chloroform	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	***0.9***	***1.3***	***0.9***	***1.8***
cis-1,2-Dichloroethene	ug/L	70	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NI	NI	NI	NI	NI	NI	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NI	NI	NI	NI	2 U	2 U	2 U	2 UJ
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NI	NI	NI	NI	***330***	***275***	***325***	***276***
Chloride	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***130***	***130***	***110***	***130***
Nitrate	mg/L	10	NI	NI	NI	NI	NI	NI	***4.2 J***	***5.1***	***4.9***	***6.3***
Sulfate	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***120***	***74***	***110***	***95***
Sulfide	mg/L	---	NI	NI	NI	NI	NI	NI	0.1 U	0.1 U	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NI	NI	NI	NI	***2.3***	***1.2***	***2.6***	***1.1***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NI	NI	NI	NI	0.005 U	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	NI	NI	NI	NI	NI	NI	***0.16***	***0.16***	***0.15***	***0.14***
Chromium, Total	mg/L	0.1	NI	NI	NI	NI	NI	NI	***0.006***	***0.006***	***0.002***	***0.002***
Lead, Total	mg/L	0.015	NI	NI	NI	NI	NI	NI	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NI	NI	NI	NI	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9w
Groundwater Data (Positive Detections Only)
Monitoring Well B354-01-27
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	NI	NI	NI	NI	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	NI	NI	NI	NI	***1***	***1.1***	***1***	***1.3***
Chloroform	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	***0.7***	***0.7***	***0.7***	***0.9***
cis-1,2-Dichloroethene	ug/L	70	NI	NI	NI	NI	NI	NI	***0.8***	***1***	***0.7***	***0.9***
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	1 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	1 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	1 U
Tetrachloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	***181***	***208***	***166***	***179***
Toluene	ug/L	1,000	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.8 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	1 U
Trichloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	***2.6***	***3.1***	***2.7***	***3.2***
Vinyl Chloride	ug/L	2	NI	NI	NI	NI	NI	NI	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NI	NI	NI	NI	2 U	2 U	2 U	2 UJ
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NI	NI	NI	NI	***403***	***397***	**414**	**381**
Chloride	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***69***	***70***	**50**	**70**
Nitrate	mg/L	10	NI	NI	NI	NI	NI	NI	***6.7 J***	***9.9***	**9.5**	**9.7**
Sulfate	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***74***	***83***	**70**	**79**
Sulfide	mg/L	---	NI	NI	NI	NI	NI	NI	0.1 U	0.1 U	0.1U	0.1U
Total Organic Carbon	mg/L	---	NI	NI	NI	NI	NI	NI	***2.6***	***1.8***	**3.5**	**1.1**
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NI	NI	NI	NI	0.005 U	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	NI	NI	NI	NI	NI	NI	***0.22***	***0.25***	***0.26***	***0.25***
Chromium, Total	mg/L	0.1	NI	NI	NI	NI	NI	NI	***0.005***	***0.006***	***0.003***	***0.003***
Lead, Total	mg/L	0.015	NI	NI	NI	NI	NI	NI	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NI	NI	NI	NI	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.

Detections equal to or exceeding MCLs are shaded.

Table 5-9x
Groundwater Data (Positive Detections Only)
Monitoring Well B354-01-28
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	NI	NI	NI	NI	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NI	NI	NI	NI	NI	NI	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NI	NI	NI	NI	2 U	2 U	2 U	2 U
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NI	NI	NI	NI	***396***	***386***	***415***	***373***
Chloride	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***25***	***24***	***28***	***32***
Nitrate	mg/L	10	NI	NI	NI	NI	NI	NI	***0.9***	***1.1***	***1.1***	***1.2***
Sulfate	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***48***	***47***	***46***	***47***
Sulfide	mg/L	---	NI	NI	NI	NI	NI	NI	0.1 U	0.1 U	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NI	NI	NI	NI	***3***	***0.9***	***2.4***	***1***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NI	NI	NI	NI	0.005 U	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	NI	NI	NI	NI	NI	NI	***0.41***	***0.44***	***0.46***	***0.43***
Chromium, Total	mg/L	0.1	NI	NI	NI	NI	NI	NI	***0.005***	***0.005***	***0.004***	***0.004***
Lead, Total	mg/L	0.015	NI	NI	NI	NI	NI	NI	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NI	NI	NI	NI	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9y
Groundwater Data (Positive Detections Only)
Monitoring Well B354-01-29c
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	NI	NI	NI	NI	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NI	NI	NI	NI	NI	NI	***0.5***	0.5 U	***0.8***	***0.8***
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	***0.6***	***0.6***	***0.7***	***0.6***
Vinyl Chloride	ug/L	2	NI	NI	NI	NI	NI	NI	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NI	NI	NI	NI	***56***	***38***	***34***	***10 J***
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NI	NI	NI	NI	***553***	***529***	***551***	***517***
Chloride	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***400***	***350***	***400***	***400***
Nitrate	mg/L	10	NI	NI	NI	NI	NI	NI	0.1 U	0.1 U	0.1 U	0.1 U
Sulfate	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***210***	***150***	***190***	***220***
Sulfide	mg/L	---	NI	NI	NI	NI	NI	NI	0.1 U	0.1 U	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NI	NI	NI	NI	***7.2***	***3.6***	***5.7***	***3.4***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NI	NI	NI	NI	***0.007***	***0.008***	***0.006***	***0.006***
Barium, Total	mg/L	2	NI	NI	NI	NI	NI	NI	***0.21***	***0.18***	***0.2***	***0.19***
Chromium, Total	mg/L	0.1	NI	NI	NI	NI	NI	NI	***0.003***	***0.005***	0.002 U	0.002 U
Lead, Total	mg/L	0.015	NI	NI	NI	NI	NI	NI	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NI	NI	NI	NI	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:
J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9z
Groundwater Data (Positive Detections Only)
Monitoring Well B354-01-30c
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	NI	NI	NI	NI	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NI	NI	NI	NI	NI	NI	***0.6***	***0.5***	***0.7***	***0.7***
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NI	NI	NI	NI	NI	NI	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NI	NI	NI	NI	***8***	***7***	***5***	***7***
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NI	NI	NI	NI	***404***	***404***	***412***	***402***
Chloride	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***67***	***60***	***60***	***50***
Nitrate	mg/L	10	NI	NI	NI	NI	NI	NI	0.1 U	0.1 U	0.1 U	0.1 U
Sulfate	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***140***	***130***	***120***	***120***
Sulfide	mg/L	---	NI	NI	NI	NI	NI	NI	0.1 U	0.1 U	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NI	NI	NI	NI	***4.7***	***1.8***	***3.6***	***1.9***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NI	NI	NI	NI	***0.015***	***0.021***	***0.021***	***0.023***
Barium, Total	mg/L	2	NI	NI	NI	NI	NI	NI	***0.15***	***0.13***	***0.13***	***0.13***
Chromium, Total	mg/L	0.1	NI	NI	NI	NI	NI	NI	***0.008***	***0.002***	0.002 U	0.002 U
Lead, Total	mg/L	0.015	NI	NI	NI	NI	NI	NI	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NI	NI	NI	NI	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9aa
Groundwater Data (Positive Detections Only)
Monitoring Well B354-01-31
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	NI	NI	NI	NI	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 UJ
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NI	NI	NI	NI	NI	NI	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NI	NI	NI	NI	***3***	***5***	***3***	2 UJ
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NI	NI	NI	NI	***395***	***363***	***365***	***392***
Chloride	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***280***	***340***	***260***	***270***
Nitrate	mg/L	10	NI	NI	NI	NI	NI	NI	0.1 UJ	0.1 U	0.1 U	0.1 U
Sulfate	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***100***	***83***	***78***	***81***
Sulfide	mg/L	---	NI	NI	NI	NI	NI	NI	0.1 U	0.1 U	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NI	NI	NI	NI	***4.5***	***2.2***	***3.8***	***2.8***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NI	NI	NI	NI	***0.009***	***0.011***	***0.01***	***0.011***
Barium, Total	mg/L	2	NI	NI	NI	NI	NI	NI	***0.12***	***0.14***	***0.12***	***0.13***
Chromium, Total	mg/L	0.1	NI	NI	NI	NI	NI	NI	***0.002***	***0.003***	0.002 U	0.002 U
Lead, Total	mg/L	0.015	NI	NI	NI	NI	NI	NI	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NI	NI	NI	NI	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded

Table 5-9bb
Groundwater Data (Positive Detections Only)
Monitoring Well B354-01-31c
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NI	NI	NI	NI	NI	NI	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 UJ
Dibromochloromethane	ug/L	100 (Note 1)	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NI	NI	NI	NI	NI	NI	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NI	NI	NI	NI	NI	NI	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NI	NI	NI	NI	NI	NI	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NI	NI	NI	NI	NI	NI	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NI	NI	NI	NI	NI	NI	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NI	NI	NI	NI	NI	NI	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NI	NI	NI	NI	NI	NI	2 U	***2***	***2***	***8 J***
Inorganics	UNITS											
Alkalinity	mg/L	---	NI	NI	NI	NI	NI	NI	***396***	***401***	***405***	***395***
Chloride	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***340***	***250***	***220***	***200***
Nitrate	mg/L	10	NI	NI	NI	NI	NI	NI	0.1 UJ	0.1 U	0.1 U	0.1 U
Sulfate	mg/L	250 (Note 4)	NI	NI	NI	NI	NI	NI	***110***	***110***	***110***	***110***
Sulfide	mg/L	---	NI	NI	NI	NI	NI	NI	0.1 U	0.1 U	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NI	NI	NI	NI	NI	NI	***2.8***	***1.1***	***3.4***	***1.1***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NI	NI	NI	NI	NI	NI	***0.015***	***0.015***	***0.016***	***0.017***
Barium, Total	mg/L	2	NI	NI	NI	NI	NI	NI	***0.34***	***0.33***	***0.29***	***0.3***
Chromium, Total	mg/L	0.1	NI	NI	NI	NI	NI	NI	0.002 U	***0.002***	0.002 U	0.002 U
Lead, Total	mg/L	0.015	NI	NI	NI	NI	NI	NI	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NI	NI	NI	NI	NI	NI	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9cc
Groundwater Data (Positive Detections Only)
Monitoring Well PZ-A
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NS	0.6 U	NS	0.6 U	0.6 U	NS	0.6 U	0.6 U	0.6 U	NS
Benzene	ug/L	5	NS	0.4 U	NS	0.4 U	0.4 U	NS	0.4 U	0.4 U	0.4 U	NS
Bromodichloromethane	ug/L	100 (Note 1)	NS	0.5 U	NS	0.5 U	0.5 U	NS	0.5 U	0.5 U	0.5 U	NS
Carbon Disulfide	ug/L	9 (Note 3)	NS	5 U	NS	5 U	5 U	NS	5 U	5 U	5 U	NS
Carbon Tetrachloride	ug/L	5	NS	0.7 U	NS	0.7 U	0.7 U	NS	0.7 U	0.7 U	0.7 U	NS
Chloroform	ug/L	100 (Note 1)	NS	0.5 U	NS	0.5 U	0.5 U	NS	0.5 U	0.5 U	0.5 U	NS
cis-1,2-Dichloroethene	ug/L	70	NS	0.5 U	NS	***1.8***	***1.7***	NS	***0.6***	0.5 U	0.5 U	NS
Dibromochloromethane	ug/L	100 (Note 1)	NS	0.7 U	NS	0.7 U	0.7 U	NS	0.7 U	0.7 U	0.7 U	NS
Ethylbenzene	ug/L	700	NS	0.7 U	NS	0.7 U	0.7 U	NS	0.7 U	0.7 U	0.7 U	NS
m,p-Xylene	ug/L	10,000 (Note 2)	NS	0.6 U	NS	0.6 U	0.6 U	NS	0.6 U	0.6 U	0.6 U	NS
o-Xylene	ug/L	10,000 (Note 2)	NS	0.6 U	NS	0.6 U	0.6 U	NS	0.6 U	0.6 U	0.6 U	NS
Tetrachloroethylene	ug/L	5	NS	1.1 U	NS	1.1 U	1.1 U	NS	1.1 U	1.1 U	1.1 U	NS
Toluene	ug/L	1,000	NS	0.4 U	NS	0.4 U	0.4 U	NS	0.4 U	0.4 U	0.4 U	NS
trans-1,2-Dichloroethene	ug/L	100	NS	0.5 U	NS	***1.9***	***2***	NS	0.5 U	0.5 U	0.5 U	NS
Trichloroethylene	ug/L	5	NS	***1.4***	NS	***1.6***	***1.6***	NS	0.6 U	0.6 U	0.6 U	NS
Vinyl Chloride	ug/L	2	NS	0.8 U	NS	0.8 U	0.8 U	NS	0.8 U	0.8 U	0.8 U	NS
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NS	10 U	NS	NA	NA	NS	NA	NA	NA	NS
Diethyl phthalate	ug/L	12,000 (Note 3)	NS	10 U	NS	NA	NA	NS	NA	NA	NA	NS
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NS	NA	NS	NA	NA	NS	NA	NA	NA	NS
Inorganics	UNITS											
Alkalinity	mg/L	---	NS	NA	NS	NA	NA	NS	NA	NA	NA	NS
Chloride	mg/L	250 (Note 4)	NS	NA	NS	NA	NA	NS	NA	NA	NA	NS
Nitrate	mg/L	10	NS	NA	NS	NA	NA	NS	NA	NA	NA	NS
Sulfate	mg/L	250 (Note 4)	NS	NA	NS	NA	NA	NS	NA	NA	NA	NS
Sulfide	mg/L	---	NS	NA	NS	NA	NA	NS	NA	NA	NA	NS
Total Organic Carbon	mg/L	---	NS	NA	NS	NA	NA	NS	NA	NA	NA	NS
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NS	NA	NS	NA	NA	NS	NA	NA	NA	NS
Barium, Total	mg/L	2	NS	NA	NS	NA	NA	NS	NA	NA	NA	NS
Chromium, Total	mg/L	0.1	NS	NA	NS	NA	NA	NS	NA	NA	NA	NS
Lead, Total	mg/L	0.015	NS	NA	NS	NA	NA	NS	NA	NA	NA	NS
Mercury, Total	mg/L	0.002	NS	NA	NS	NA	NA	NS	NA	NA	NA	NS

Notes:
J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9dd
Groundwater Data (Positive Detections Only)
Monitoring Well PZ-C
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NS	0.6 U			0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NS	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NS	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NS	0.7 U	0.5 U	0.5 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	ug/L	100 (Note 1)	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NS	***7.8***	***4.9***	***5.4***	***9.2***	***6.4***	***4.8***	***5.7***	***5.5***	***4.7***
Toluene	ug/L	1,000	NS	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NS	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NS	NA	NA	NA	NA	NA	2 U	2 U	2 U	2 U
Inorganics	UNITS											
Alkalinity	mg/L	---	NS	NA	NA	NA	NA	NA	***434***	***406***	***433***	***393***
Chloride	mg/L	250 (Note 4)	NS	NA	NA	NA	NA	NA	***360***	***340***	***300***	***350***
Nitrate	mg/L	10	NS	NA	NA	NA	NA	NA	***11.4***	***11.6***	***9.3***	***9.7***
Sulfate	mg/L	250 (Note 4)	NS	NA	NA	NA	NA	NA	***160***	***140***	***160***	***170***
Sulfide	mg/L	---	NS	NA	NA	NA	NA	NA	0.1 U	0.1 UR	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NS	NA	NA	NA	NA	NA	***2.1***	***16.4***	***3.9***	***2***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NS	0.005 U	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	NS	***0.2***	NA	NA	NA	NA	***0.16***	***0.15***	***0.16***	***0.16***
Chromium, Total	mg/L	0.1	NS	***0.004***	NA	NA	NA	NA	***0.086***	***0.034***	***0.015***	***0.012***
Lead, Total	mg/L	0.015	NS	***0.005***	NA	NA	NA	NA	0.003 U	***0.004***	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NS	0.0002 U	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9ee
Groundwater Data (Positive Detections Only)
Monitoring Well PZ-D
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NS	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NS	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NS	0.7 U	***0.9***	***1.3***	0.7 U	***1.6***	0.5 U	0.7 U	0.7 U	***0.8***
Chloroform	ug/L	100 (Note 1)	NS	***0.5***	***0.7***	***1.2***	0.5 U	***0.9***	0.5 U	0.5 U	0.5 U	***0.5***
cis-1,2-Dichloroethene	ug/L	70	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	ug/L	100 (Note 1)	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NS	***1.8***	***2.7***	***8.6***	1.1 U	***9.7***	***7.8***	***7.1***	***4.6***	***5.6***
Toluene	ug/L	1,000	NS	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NS	0.6 U	0.6 U	0.6 U	0.6 U	***0.6***	0.6 U	***1.2***	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NS	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NS	NA	NA	NA	NA	NA	2 U	2 U	2 U	2 U
Inorganics	UNITS											
Alkalinity	mg/L	---	NS	NA	NA	NA	NA	NA	***339***	***482***	***400***	***371***
Chloride	mg/L	250 (Note 4)	NS	NA	NA	NA	NA	NA	***140***	***120***	***160***	***180***
Nitrate	mg/L	10	NS	NA	NA	NA	NA	NA	***8.8***	***9.1***	***15.3***	***11***
Sulfate	mg/L	250 (Note 4)	NS	NA	NA	NA	NA	NA	***71***	***75***	***63***	***79***
Sulfide	mg/L	---	NS	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NS	NA	NA	NA	NA	NA	***1.8***	***2.2***	***4.3***	***3***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NS	***0.006***	NA	NA	NA	NA	0.005 U	***0.007***	***0.006***	***0.007***
Barium, Total	mg/L	2	NS	***0.2***	NA	NA	NA	NA	***0.18***	***0.24***	***0.26***	***0.26***
Chromium, Total	mg/L	0.1	NS	***0.005***	NA	NA	NA	NA	***0.031***	***0.04***	***0.027***	***0.049***
Lead, Total	mg/L	0.015	NS	***0.004***	NA	NA	NA	NA	***0.004***	***0.016***	***0.01***	***0.009***
Mercury, Total	mg/L	0.002	NS	0.0002 U	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9ff
Groundwater Data (Positive Detections Only)
Monitoring Well PSF92-01
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NS	NS	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NS	NS	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NS	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	ug/L	100 (Note 1)	NS	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NS	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NS	NS	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NS	NS	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NS	NS	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NS	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NS	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NS	NS	NA	NA	NA	NA	2 U	2 U	2 U	2 U
Inorganics	UNITS											
Alkalinity	mg/L	---	NS	NS	NA	NA	NA	NA	***173***	***248***	***200***	***179***
Chloride	mg/L	250 (Note 4)	NS	NS	NA	NA	NA	NA	***6***	***24***	***14***	***10***
Nitrate	mg/L	10	NS	NS	NA	NA	NA	NA	***0.1***	***3.4***	***2.2***	***1.6***
Sulfate	mg/L	250 (Note 4)	NS	NS	NA	NA	NA	NA	***370***	***240***	***390***	***450***
Sulfide	mg/L	---	NS	NS	NA	NA	NA	NA	0.1 U	0.1 UR	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NS	NS	NA	NA	NA	NA	***1.2***	***1.2***	***1***	***1***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NS	NS	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	NS	NS	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Chromium, Total	mg/L	0.1	NS	NS	NA	NA	NA	NA	***0.003***	***0.006***	0.002 U	***0.003***
Lead, Total	mg/L	0.015	NS	NS	NA	NA	NA	NA	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NS	NS	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.
Detections equal to or exceeding MCLs are shaded.

Table 5-9gg
Groundwater Data (Positive Detections Only)
Monitoring Well PSF92-05
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NS	NS	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NS	NS	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NS	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	ug/L	100 (Note 1)	NS	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NS	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NS	NS	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NS	NS	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NS	NS	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NS	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NS	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NS	NS	NA	NA	NA	NA	2 U	2 U	2 U	2 U
Inorganics	UNITS											
Alkalinity	mg/L	---	NS	NS	NA	NA	NA	NA	***318***	***345***	***440***	***368***
Chloride	mg/L	250 (Note 4)	NS	NS	NA	NA	NA	NA	***90***	***70***	***60***	***60***
Nitrate	mg/L	10	NS	NS	NA	NA	NA	NA	***10.6***	***11.5***	***12.1***	***12.6***
Sulfate	mg/L	250 (Note 4)	NS	NS	NA	NA	NA	NA	***93***	***110***	***110***	***110***
Sulfide	mg/L	---	NS	NS	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NS	NS	NA	NA	NA	NA	***0.9***	***1.4***	***3.8***	***2.8***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NS	NS	NA	NA	NA	NA	0.005 U	***0.012***	***0.018***	***0.017***
Barium, Total	mg/L	2	NS	NS	NA	NA	NA	NA	***0.13***	***0.11***	***0.12***	***0.12***
Chromium, Total	mg/L	0.1	NS	NS	NA	NA	NA	NA	0.002 U	***0.003***	***0.004***	0.002 U
Lead, Total	mg/L	0.015	NS	NS	NA	NA	NA	NA	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NS	NS	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.

Detections equal to or exceeding MCLs are shaded.

Table 5-9hh
Groundwater Data (Positive Detections Only)
Monitoring Well MPL94-01
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	ND	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	5 U	NS	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	ND	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	ND	NS	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	ND	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	ND	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	5 U	NS	***1.5***	***1.9***	***2.2***	***1.4***	***2***	***1.9***	***1.7***	***2.1***
Dibromochloromethane	ug/L	100 (Note 1)	ND	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	ND	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	ND	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	ND	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	5 U	NS	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	ND	NS	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	ND	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	ND	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	ND	NS	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	10 U	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	***7.3 J***	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NA	NS	NA	NA	NA	NA	***4***	***9***	***4***	***6***
Inorganics	UNITS											
Alkalinity	mg/L	---	NA	NS	NA	NA	NA	NA	***509***	***505***	***567***	***513***
Chloride	mg/L	250 (Note 4)	NA	NS	NA	NA	NA	NA	***100***	***100***	***100***	***100***
Nitrate	mg/L	10	NA	NS	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Sulfate	mg/L	250 (Note 4)	NA	NS	NA	NA	NA	NA	***200***	***180***	***190***	***200***
Sulfide	mg/L	---	NA	NS	NA	NA	NA	NA	0.1 U	0.1 UR	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NA	NS	NA	NA	NA	NA	***3.6***	***5***	***4.4***	***4.8***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	0.004 JR	NS	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	***0.177***	NS	NA	NA	NA	NA	***0.14***	***0.16***	***0.19***	***0.2***
Chromium, Total	mg/L	0.1	0.005 U	NS	NA	NA	NA	NA	0.002 U	0.002 U	***0.004***	0.002 U
Lead, Total	mg/L	0.015	0.002 UR	NS	NA	NA	NA	NA	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	0.0002 U	NS	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act
USEPA - United States Environmental Protection Agency

September 1997 groundwater samples were analyzed at ITS Laboratories. The validity of this data is questionable, but it is included here for completeness.

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.

Detections equal to or exceeding MCLs are shaded.

Table 5-9ii
Groundwater Data (Positive Detections Only)
Monitoring Well MPL94-02
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	ND	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	5 U	NS	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	ND	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	ND	NS	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	ND	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	ND	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	5 U	NS	***1.7***	***2***	***2.2***	***2.8***	***3***	***2.3***	***2.4***	***2.8***
Dibromochloromethane	ug/L	100 (Note 1)	ND	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	ND	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	ND	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	ND	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	5 U	NS	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	ND	NS	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	ND	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	ND	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	ND	NS	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	10 U	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	10 U	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NA	NS	NA	NA	NA	NA	***4***	***3***	***5***	***6***
Inorganics	UNITS											
Alkalinity	mg/L	---	NA	NS	NA	NA	NA	NA	***597***	***470***	***561***	***474***
Chloride	mg/L	250 (Note 4)	NA	NS	NA	NA	NA	NA	***200***	***120***	***140***	***160***
Nitrate	mg/L	10	NA	NS	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Sulfate	mg/L	250 (Note 4)	NA	NS	NA	NA	NA	NA	***250***	***160***	***160***	***150***
Sulfide	mg/L	---	NA	NS	NA	NA	NA	NA	0.1 U	***0.1 R***	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NA	NS	NA	NA	NA	NA	***3.5***	***3.4***	***3.2***	***4.7***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	*0.0046 JU*	NS	NA	NA	NA	NA	***0.007***	***0.008***	***0.008***	***0.006***
Barium, Total	mg/L	2	***0.169***	NS	NA	NA	NA	NA	***0.2***	***0.15***	***0.18***	***0.19***
Chromium, Total	mg/L	0.1	0.005 U	NS	NA	NA	NA	NA	0.002 U	***0.004***	***0.01***	0.002 U
Lead, Total	mg/L	0.015	***0.0017 J***	NS	NA	NA	NA	NA	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	0.0002 U	NS	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

September 1997 groundwater samples were analyzed at ITS Laboratories. The validity of this data is questionable, but it is included here for completeness.

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.

Detections equal to or exceeding MCLs are shaded.

Table 5-9jj
Groundwater Data (Positive Detections Only)
Monitoring Well MPL94-03
354 Area Solvent Detections RI Report
Fort Riley, Kansas

		Date Sampled:	Sep-97	Nov-98	Feb-00	Jul-00	Oct-00	Mar-01	Oct-01	Jan-02	Apr-02	Jul-02
Volatiles	UNITS	MCL/KSWQS										
1,1,2-Trichloroethane	ug/L	5	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Benzene	ug/L	5	NS	NS	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Bromodichloromethane	ug/L	100 (Note 1)	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	ug/L	9 (Note 3)	NS	NS	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	ug/L	5	NS	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Chloroform	ug/L	100 (Note 1)	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	ug/L	70	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	***0.8***	0.5 U	***0.7***
Dibromochloromethane	ug/L	100 (Note 1)	NS	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Ethylbenzene	ug/L	700	NS	NS	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
m,p-Xylene	ug/L	10,000 (Note 2)	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
o-Xylene	ug/L	10,000 (Note 2)	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Tetrachloroethylene	ug/L	5	NS	NS	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Toluene	ug/L	1,000	NS	NS	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	ug/L	100	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethylene	ug/L	5	NS	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Vinyl Chloride	ug/L	2	NS	NS	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles	UNITS											
Bis(2-ethylhexyl)phthalate	ug/L	6	NS	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	ug/L	12,000 (Note 3)	NS	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous Analyses	UNITS											
Methane	ug/L	---	NS	NS	NA	NA	NA	NA	2 U	***7***	***3***	***5***
Inorganics	UNITS											
Alkalinity	mg/L	---	NS	NS	NA	NA	NA	NA	***760***	***551***	***585***	***533***
Chloride	mg/L	250 (Note 4)	NS	NS	NA	NA	NA	NA	***140***	***90***	***100***	***100***
Nitrate	mg/L	10	NS	NS	NA	NA	NA	NA	***0.3***	0.1 U	***0.3***	***0.1***
Sulfate	mg/L	250 (Note 4)	NS	NS	NA	NA	NA	NA	***420***	***190***	***190***	***190***
Sulfide	mg/L	---	NS	NS	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Total Organic Carbon	mg/L	---	NS	NS	NA	NA	NA	NA	***9.4***	***5.1***	***6.7***	***5.3***
RCRA Metals	UNITS											
Arsenic, Total	mg/L	0.05	NS	NS	NA	NA	NA	NA	***0.006***	0.005 U	0.005 U	0.005 U
Barium, Total	mg/L	2	NS	NS	NA	NA	NA	NA	0.1 U	***0.1***	0.1 U	0.1 U
Chromium, Total	mg/L	0.1	NS	NS	NA	NA	NA	NA	0.002 U	0.002 U	***0.002***	0.002 U
Lead, Total	mg/L	0.015	NS	NS	NA	NA	NA	NA	0.003 U	0.003 U	0.003 U	0.003 U
Mercury, Total	mg/L	0.002	NS	NS	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Notes:

J - Qualified as estimated
R - Qualified as rejected
U - Qualified as undetected by laboratory
NA - Well sampled, but compound not analyzed
ND - Not Detected (reporting limit unknown)
NI - Not Installed (at time of sampling)
NS - Monitoring Well/Piezometer not sampled
mg/L - milligrams per liter
USEPA - United States Environmental Protection Agency

ug/L - micrograms per liter
Chloroform - Trichloromethane
Carbon Tetrachloride - Tetrachloromethane
KSWQS - Kansas State Water Quality Standards
MCL - USEPA Maximum Contaminant Limit
RCRA - Resource Conservation and Recovery Act

1. USEPA MCL for total trihalomethanes is 100 ug/L.
2. USEPA MCL for total xylenes is 10,000 ug/L.
3. KDHE RSK value for groundwater pathway.
4. Secondary MCL.

Positive detections are in bold and italics.

Detections equal to or exceeding MCLs are shaded.

Table 5-10
Groundwater-Screening Results
(May/June 2001)
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Date*	*Reported DCE ug/L*	*Reported CCl_4 ug/L*	*Reported TCE ug/L*	*Reported PCE ug/L*	*Reported BTEX ug/L*
B754	06/12/01	2U	2U	2U	2U	2U
B756	06/12/01	2U	2U	2U	2U	2U
B759	06/11/01	2U	2U	2U	2U	2U
B760	06/12/01	2U	2U	2U	2U	2U
B760 Dup	06/12/01	2U	2U	2U	2U	2U
B761	06/12/01	2U	2U	2U	2U	2U
B768	05/23/01	2U	1.6J	2U	2U	2U
B770	05/23/01	2U	2U	2U	2U	2U
B771	05/23/01	2U	2U	2U	2U	2U
B777A	06/11/01	2U	5.1	2U	2U	2U
B778	05/23/01	2U	2U	2U	2U	2U
B779	05/24/01	2U	2U	2U	2U	2U
B780	05/24/01	2U	2U	2U	2U	2U
B787	05/30/01	2U	2U	2U	2U	2U
B787 Dup	05/30/01	2U	2U	2U	2U	2U
B788	05/29/01	2U	2U	2U	2U	2U
B789	05/29/01	2U	2U	2U	2U	2U
B790	05/29/01	2U	0.3J	2U	2U	2U
B791	05/29/01	2U	2U	2U	2U	2U
B793	05/31/01	2U	2U	2U	2U	2U
B794	05/31/01	2U	2U	2U	2U	2U
B796	05/25/01	2U	2U	2U	2U	2U
B797	06/07/01	2U	2U	2U	2U	2U
B798	06/06/01	2U	2U	2U	2U	2U
B799A	06/08/01	2U	2U	2U	2U	2U
B800A	06/08/01	2U	2U	2U	2U	2U
B800A Dup	06/08/01	2U	2U	2U	2U	2U
B803	05/31/01	2U	2U	2U	2U	2U
B804	05/31/01	2U	2U	2U	2U	2U
B805	05/30/01	2U	2U	2U	2U	2U
B806	06/08/01	2U	2U	2U	2U	2U
B807	05/31/01	2.2	2U	2U	2U	2U
B809	06/01/01	2U	2U	2U	2U	2U
B810	06/01/01	2U	2U	2U	2U	2U
B811	06/01/01	2U	2U	2U	2U	2U
B811 Dup	06/01/01	2U	2U	2U	2U	2U

Table 5-10 (continued)
Groundwater-Screening Results
(May/June 2001)
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Number	*Date*	*Reported DCE ug/L*	*Reported CCl_4 ug/L*	*Reported TCE ug/L*	*Reported PCE ug/L*	*Reported BTEX ug/L*
B816	06/11/01	2U	2U	2U	2U	2U
B817	06/04/01	2U	2U	2U	2U	2U
B818	06/04/01	2U	2U	2U	2U	2U
B819	06/04/01	2U	2U	2U	2U	2U
B820	06/04/01	2U	0.6J	2U	2U	2U
B821	06/04/01	2U	2U	2U	2U	2U
B822	06/01/01	2U	2U	2U	2U	2U
B823	06/04/01	2U	2U	2U	2U	2U
B824	06/04/01	2U	2U	2U	2U	2U
B825	06/01/01	2U	2U	2U	2U	2U
B826	06/01/01	2U	2U	2U	2U	2U
B827	06/01/01	2U	2U	2U	2U	2U
B828	06/06/01	2U	2U	2U	2U	2U
B830	06/01/01	2U	2U	2U	2U	2U
B831	06/05/01	2U	2U	2U	2U	2U
B832	06/05/01	2U	2U	2U	2U	2U
B834	06/05/01	2U	2U	2U	2U	2U
B836	05/31/01	2U	2U	2U	2U	2U
B837	05/25/01	2U	2U	2U	2U	2U
B838	06/05/01	2U	2U	2U	2U	2U
B839	05/25/01	2U	2U	2U	2U	2U
B839 Dup	05/25/01	2U	2U	2U	2U	2U
B840	05/25/01	2U	2U	2U	2U	2U
B841	05/25/01	2U	2U	2U	2U	2U
B842	06/05/01	2U	2U	2U	2U	2U
B843	06/05/01	2U	2U	2U	2U	2U
B1411	06/11/01	2U	2U	2U	2U	2U
B1412	06/08/01	2U	2U	2U	3.7	2U
B1416	06/08/01	2U	2U	2U	2U	2U
B1417	06/08/01	2U	2U	2U	2U	2U
B1417 Dup	06/08/01	2U	2U	2U	2U	2U

Notes:

BTEX - Benzene, Toluene, Ethylbenzene, meta-, para- and ortho-Xylenes
CCl_4 - Carbon Tetrachloride
DCE - 1,2-Dichloroethene
J - Estimated value below the reporting limit
PCE - Tetrachloroethene
TCE - Trichloroethene
U - Undetected by EPS
ug/L - micrograms per liter

Table 6-1
Field and Natural Attenuation Parameters
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	TS0292-01				TS0292-02			
Sample Date	Units	Conditions(1)	10/2/2001	1/16/2002	4/23/2002	7/9/2002	10/3/2001	1/16/2002	4/23/2002	7/10/2002
Field Stabilization Parameters (2)										
Temperature	°C	>20°C	**22.0**	12.5	17.7	18.8	17.6	9.2	19.3	19.9
pH	SU	5 < x < 9	**6.7**	**7.4**	**6.57**	**6.94**	**7.2**	**6.9**	**6.38**	**6.60**
Conductivity	umhos/cm	NAp	1,400	2,100	1270	1520	1,400	1,250	1690	1710
Turbidity	NTU	NAp	5.00	5.88	0.57	1.10	59.7	11.9	17.4	11.3
Natural Attenuation Parameters										
Methane	ug/L	> 500	2 U	2 U	22	2 U	2 U	270	189	387
Ethane	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Ethene	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Alkalinity, as CaCO3	mg/L	> 680 or 816 (3)	369	338	354	346	499	501	559	504
Total Organic Carbon	mg/L	> 20	2.2	3.2	2.3	3.5	7.8	5.6	8.4	7.0
Nitrate, as N	mg/L	< 1	10.8	12.3	12.4	9.8	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**
Sulfate	mg/L	< 20	110	120	120	110	**7**	**1 U**	**2**	**1.0**
Sulfide	mg/L	> 1	0.1 U	0.1 UJ	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U	0.1 U
Chloride	mg/L	> 56 or 86 (4)	**180**	**180**	**170**	**170**	**180**	**170**	**190**	**190**
DO(2)	mg/L	< 0.5	**0.49**	3.27	3.98	1.05	1.64	**0.02**	6.14	1.66
Oxidation/Reduction Potential(2)	mV	< 50	88	59	**34**	**-13**	**-56**	**-216**	**-208**	**-153**
Iron (II), Ferrous(2)	mg/L	> 1	0.15	0.19	0.02	**1.33**	**6.28**	**5.09**	**5.46**	**8.08**

NOTES

(1) From USEPA 1998; These geochemical conditions represent a range that is favorable for reductive dechlorination. The shaded and bold areas indicate results in the favorable range.

(2) Field Measurement

(3) These values represent two time the background value as per natural attenuation protocol (USEPA, 1998). Average values for alkalinity of groundwater from the Kansas River alluvial deposits is 340 mg/L, with a range of 170-470 mg/L (Fader, 1974). Average values for alkalinity of groundwater from the upland aquifer is 408 mg/L, with a range of 376-454 mg/L (LBA, 1996). Therefore, twice the average values are 680 mg/L (alluvial) and 816 ug/L (terrace).

(4) These values represent two time the background value as per natural attenuation protocol (USEPA, 1998). Average values for chloride of groundwater from the Kansas River alluvial deposits is 28 mg/L, with a range of 3.0 - 84 mg/L (Fader, 1974). Average values for chloride of groundwater from the upland aquifer is 43 mg/L, with a range of 6 - 130 mg/L (this report). Therefore, twice the average values are 56 mg/L (alluvial) and 86 mg/L (terrace).

mg/L - milligrams per liter
ug/L - micrograms per liter
°C - degrees Celsius
mV - millivolts
NTU - Nephelometric turbidity units
U - Qualified as undetected by the laboratory
umhos/cm - micromhos per centimeter

NA - Not Analyzed
NAp - Not Applicable
J - Estimated
NS - Not Sampled
DO - Dissolved Oxygen
SU - standard units

Table 6-1 (continued)
Field and Natural Attenuation Parameters
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	MW95-03				MW95-04			
Sample Date	Units	Conditions$^{(1)}$	9/27/2001	1/17/2002	4/29/2002	7/10/2002	10/4/2001	1/15/2002	4/23/2002	7/10/2002
Field Stabilization Parameters $^{(2)}$										
Temperature	°C	>20°C	18.9	15.3	16.3	16.9	17.6	15.1	18.0	19.0
pH	SU	5 < x < 9	**6.9**	**6.9**	**6.45**	**6.67**	**6.9**	**7.1**	**6.94**	**6.80**
Conductivity	umhos/cm	NAp	1,500	1,430	1950	1940	1,100	990	580	810
Turbidity	NTU	NAp	11.7	2.04	3.08	2.70	9.85	3.81	2.65	2.80
Natural Attenuation Parameters										
Methane	ug/L	> 500	2 U	9	3	12	2 U	2 U	2 U	2 U
Ethane	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Ethene	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Alkalinity, as CaCO3	mg/L	> 680 or 816 $^{(3)}$	531	490	520	512	344	338	225	315
Total Organic Carbon	mg/L	> 20	2.7	3.3	6.1	4.4	2.4	1.9	1.2	4.7
Nitrate, as N	mg/L	< 1	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**	10.6	11.7	5.4	9.5
Sulfate	mg/L	< 20	66	130	190	83	51	48	26	54
Sulfide	mg/L	> 1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U	0.1 U
Chloride	mg/L	> 56 or 86 $^{(4)}$	**170**	**230**	**280**	**250**	**110**	**80**	50	**80**
DO$^{(2)}$	mg/L	< 0.5	0.99	**0.22**	1.00	**0.42**	2.60	3.90	7.63	6.22
Oxidation/Reduction Potential$^{(2)}$	mV	< 50	**-44**	**-48**	**-14**	**-94**	**48**	120	**34**	156
Iron (II), Ferrous$^{(2)}$	mg/L	> 1	**4.14**	**8.04**	**1.80**	**5.74**	0.13	0.03	0.01	0.03

NOTES

(1) From USEPA 1998; These geochemical conditions represent a range that is favorable for reductive dechlorination. The shaded and bold areas indicate results favorable range.

(2) Field Measurement

(3) These values represent two time the background value as per natural attenuatic (USEPA, 1998). Average values for alkalinity of groundwater from the Kansas River alluvial deposits is 340 mg/L, with a range of 170-470 mg/L (Fader, 1974). A values for alkalinity of groundwater from the upland aquifer is 408 mg/L, with a ran 376-454 mg/L (LBA, 1996). Therefore, twice the average values are 680 mg/L (all 816 ug/L (terrace).

(4) These values represent two time the background value as per natural attenuatic (USEPA, 1998). Average values for chloride of groundwater from the Kansas Rive alluvial deposits is 28 mg/L, with a range of 3.0 - 84 mg/L (Fader, 1974). Average chloride of groundwater from the upland aquifer is 43 mg/L, with a range of 6 - 130 (this report). Therefore, twice the average values are 56 mg/L (alluvial) and 86 mg (terrace).

mg/L - milligrams per liter
ug/L - micrograms per liter
°C - degrees Celsius
mV - millivolts
NTU - Nephelometric turbidity units
U - Qualified as undetected by the laboratory
umhos/cm - micromhos per centimeter

NA - Not Analyzed
NAp - Not Applicable
J - Estimated
NS - Not Sampled
DO - Dissolved Oxygen
SU - standard units

Table 6-1 (continued)
Field and Natural Attenuation Parameters
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	MW95-06				B354-99-07			
Sample Date	Units	Conditions(1)	10/4/2001	1/17/2002	4/30/2002	7/10/2002	9/26/2001	1/16/2002	4/23/2002	7/9/2002
Field Stabilization Parameters (2)										
Temperature	°C	>20°C	18.5	8.5	18.5	**20.3**	18.8	12.2	17.6	18.8
pH	SU	5 < x < 9	**7.1**	**6.7**	**6.71**	**6.74**	**7.0**	**7.6**	**6.71**	**6.92**
Conductivity	umhos/cm	NAp	1,300	1,400	1300	1380	1,100	1,370	1120	855
Turbidity	NTU	NAp	6.91	22.3	0.70	0.50	2.86	7.99	0.53	5.40
Natural Attenuation Parameters										
Methane	ug/L	> 500	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Ethane	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Ethene	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Alkalinity, as CaCO3	mg/L	> 680 or 816 (3)	337	320	323	294	326	323	358	322
Total Organic Carbon	mg/L	> 20	1.7	1.5	2.4	0.8	1.7	1.4	1.6	6.1
Nitrate, as N	mg/L	< 1	12.8	12	9.9	11	10.8	10.8	11.3	11.3
Sulfate	mg/L	< 20	100	110	100	100	120	100	110	120
Sulfide	mg/L	> 1	0.1 U	0.1 UJ	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U	0.1 U
Chloride	mg/L	> 56 or 86 (4)	**170**	**140**	**140**	**160**	80	60	70	80
DO(2)	mg/L	< 0.5	3.62	4.51	4.69	3.51	6.10	4.76	6.69	6.98
Oxidation/Reduction Potential(2)	mV	< 50	152	284	185	186	246	229	90	158
Iron (II), Ferrous(2)	mg/L	> 1	0.00	0.06	0.01	0.01	0.13	0.05	0.01	0.00

NOTES

(1) From USEPA 1998; These geochemical conditions represent a range that is favorable for reductive dechlorination. The shaded and bold areas indicate results favorable range.

(2) Field Measurement

(3) These values represent two time the background value as per natural attenuati (USEPA, 1998). Average values for alkalinity of groundwater from the Kansas River alluvial deposits is 340 mg/L, with a range of 170-470 mg/L (Fader, 1974). A values for alkalinity of groundwater from the upland aquifer is 408 mg/L, with a ran 376-454 mg/L (LBA, 1996). Therefore, twice the average values are 680 mg/L (all 818 ug/L (terrace).

(4) These values represent two time the background value as per natural attenuati (USEPA, 1998). Average values for chloride of groundwater from the Kansas Rive alluvial deposits is 28 mg/L, with a range of 3.0 - 84 mg/L (Fader, 1974). Average chloride of groundwater from the upland aquifer is 43 mg/L, with a range of 6 - 130 (this report). Therefore, twice the average values are 56 mg/L (alluvial) and 86 mg (terrace).

mg/L - milligrams per liter
ug/L - micrograms per liter
°C - degrees Celsius
mV - millivolts
NTU - Nephelometric turbidity units
U - Qualified as undetected by the laboratory
umhos/cm - micromhos per centimeter

NA - Not Analyzed
NAp - Not Applicable
J - Estimated
NS - Not Sampled
DO - Dissolved Oxygen
SU - standard units

Table 6-1 (continued)
Field and Natural Attenuation Parameters
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	B354-99-08				B354-99-09			
Sample Date	Units	Conditions(1)	9/27/2001	1/17/2002	4/25/2002	7/10/2002	9/25/2001	1/15/2002	4/24/2002	7/9/2002
Field Stabilization Parameters (2)										
Temperature	°C	>20°C	17.7	14.6	17.3	18.3	17.0	10.0	14.1	18.7
pH	SU	5 < x < 9	**7.0**	**7.0**	**6.63**	**7.00**	**6.9**	**6.6**	**6.51**	**6.71**
Conductivity	umhos/cm	NAp	1400	1,340	1270	1390	1,700	2,500	1660	2090
Turbidity	NTU	NAp	8.56	22.0	28.5	6.10	4.26	2.56	2.29	2.10
Natural Attenuation Parameters										
Methane	ug/L	> 500	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Ethane	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Ethene	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Alkalinity, as CaCO3	mg/L	> 680 or 816 (3)	386	339	380	317	286	282	315	278
Total Organic Carbon	mg/L	> 20	1.7	1.8	1.5	1.7	1.3	1.5	1.2	1.8
Nitrate, as N	mg/L	< 1	6	6.8	5.6	6.8	27	25	29	34
Sulfate	mg/L	< 20	190	170	130	140	130	130	140	170
Sulfide	mg/L	> 1	0.1 U	0.1 UJ	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U	0.1 U
Chloride	mg/L	> 56 or 86 (4)	**110**	**120**	**140**	**140**	**270**	**250**	**290**	**300**
DO(2)	mg/L	< 0.5	4.99	3.98	5.97	4.29	4.68	5.47	8.73	7.64
Oxidation/Reduction Potential(2)	mV	< 50	94	281	167	236	123	112	158	155
Iron (II), Ferrous(2)	mg/L	> 1	0.01	0.02	0.05	0.06	0.02	0.08	0.00	0.02

NOTES

(1) From USEPA 1998; These geochemical conditions represent a range that is favorable for reductive dechlorination. The shaded and bold areas indicate results favorable range.

(2) Field Measurement

(3) These values represent two time the background value as per natural attenuatic (USEPA, 1998). Average values for alkalinity of groundwater from the Kansas River alluvial deposits is 340 mg/L, with a range of 170-470 mg/L (Fader, 1974). A values for alkalinity of groundwater from the upland aquifer is 408 mg/L, with a ran 376-454 mg/L (LBA, 1996). Therefore, twice the average values are 680 mg/L (all 816 ug/L (terrace).

(4) These values represent two time the background value as per natural attenuatic (USEPA, 1998). Average values for chloride of groundwater from the Kansas Rive alluvial deposits is 28 mg/L, with a range of 3.0 - 84 mg/L (Fader, 1974). Average chloride of groundwater from the upland aquifer is 43 mg/L, with a range of 6 - 130 (this report). Therefore, twice the average values are 56 mg/L (alluvial) and 86 mg (terrace).

mg/L	milligrams per liter
ug/L	micrograms per liter
°C	degrees Celsius
mV	millivolts
NTU	Nephelometric turbidity units
U	Qualified as undetected by the laboratory
umhos/cm	micromhos per centimeter

NA	Not Analyzed
NAp	Not Applicable
J	Estimated
NS	Not Sampled
DO	Dissolved Oxygen
SU	standard units

Table 6-1 (continued)
Field and Natural Attenuation Parameters
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	B354-00-10				B354-99-12			
Sample Date	Units	Conditions[1]	9/25/2001	1/16/2002	4/24/2002	7/9/2002	9/26/2001	1/22/2002	4/24/2002	7/15/2002
Field Stabilization Parameters [2]										
Temperature	°C	>20°C	16.4	13.5	16.2	18.1	12.5	14.4	13.0	15.2
pH	SU	5 < x < 9	**7.4**	**7.5**	**7.02**	**7.16**	**7.1**	**7.1**	**6.77**	**7.05**
Conductivity	umhos/cm	NAp	1,500	1,220	1,330	1,590	1,400	1,460	840	1,590
Turbidity	NTU	NAp	3.29	0.46	11.8	7.00	3.23	0.85	0.63	5.20
Natural Attenuation Parameters										
Methane	ug/L	> 500	2 U	5	5	4	2 U	2 U	2 U	2 U
Ethane	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Ethene	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Alkalinity, as CaCO3	mg/L	> 680 or 816 [3]	211	219	239	215	445	462	468	494
Total Organic Carbon	mg/L	> 20	0.5 U	0.5	0.5 U	0.5 U	2.3	2.7	2.7	2.9
Nitrate, as N	mg/L	< 1	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**
Sulfate	mg/L	< 20	650	610	620	640	140	130	150	150
Sulfide	mg/L	> 1	0.1 U	0.1 UJ	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Chloride	mg/L	> 56 or 86 [4]	11	11	10	10	**130**	**130**	**130**	**130**
DO[2]	mg/L	< 0.5	2.39	**0.20**	4.46	6.41	1.20	4.03	3.84	0.92
Oxidation/Reduction Potential[2]	mV	< 50	**3**	**-8**	83	**-8**	61	**-51**	72	**16**
Iron (II), Ferrous[2]	mg/L	> 1	0.05	0.15	0.16	0.13	0.02	0.04	0.03	0.08

NOTES

(1) From USEPA 1998; These geochemical conditions represent a range that is favorable for reductive dechlorination. The shaded and bold areas indicate results favorable range.

(2) Field Measurement

(3) These values represent two time the background value as per natural attenuati (USEPA, 1998). Average values for alkalinity of groundwater from the Kansas River alluvial deposits is 340 mg/L, with a range of 170-470 mg/L (Fader, 1974). A values for alkalinity of groundwater from the upland aquifer is 408 mg/L, with a ran 376-454 mg/L (LBA, 1996). Therefore, twice the average values are 680 mg/L (all 816 ug/L (terrace).

(4) These values represent two time the background value as per natural attenuati (USEPA, 1998). Average values for chloride of groundwater from the Kansas Rive alluvial deposits is 28 mg/L, with a range of 3.0 - 84 mg/L (Fader, 1974). Average chloride of groundwater from the upland aquifer is 43 mg/L, with a range of 6 - 130 (this report). Therefore, twice the average values are 56 mg/L (alluvial) and 86 mg (terrace).

mg/L - milligrams per liter
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NTU - Nephelometric turbidity units
U - Qualified as undetected by the laboratory

NA - Not Analyzed
NAp - Not Applicable
J - Estimated
NS - Not Sampled
DO - Dissolved Oxygen
SU - standard units

Table 6-1 (continued)
Field and Natural Attenuation Parameters
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	B354-99-12b				B354-99-12c			
Sample Date	Units	Conditions(1)	10/1/2001	1/16/2002	4/24/2002	7/15/2002	10/1/2001	1/16/2002	4/24/2002	7/16/2002
Field Stabilization Parameters (2)										
Temperature	°C	>20°C	16.5	11.9	14.0	14.4	15.9	11.1	14.2	14.0
pH	SU	5 < x < 9	**6.9**	**7.9**	**6.73**	**6.75**	**7.0**	**7.8**	**6.81**	**6.96**
Conductivity	umhos/cm	NAp	1,500	2,200	940	1,800	1,600	2,200	1,000	1,800
Turbidity	NTU	NAp	4.28	28.3	3.10	7.40	24.0	25.1	2.34	3.40
Natural Attenuation Parameters										
Methane	ug/L	> 500	2 U	2 U	10	3	2 U	9	2 U	2 UJ
Ethane	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Ethene	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 UJ
Alkalinity, as CaCO3	mg/L	> 680 or 816 (3)	402	381	441	427	403	422	409	432
Total Organic Carbon	mg/L	> 20	1.7	2.5	2.1	2.1	1.6	3.3	1.9	2.1
Nitrate, as N	mg/L	< 1	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 UJ**
Sulfate	mg/L	< 20	180	160	170	170	170	150	160	170
Sulfide	mg/L	> 1	0.1 U	0.1 UJ	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U	0.1 U
Chloride	mg/L	> 56 or 86 (4)	**230**	**200**	**180**	**210**	**240**	**160**	**210**	**240**
DO(2)	mg/L	< 0.5	**0.21**	**0.00**	3.71	0.75	0.66	**0.00**	4.53	**0.39**
Oxidation/Reduction Potential(2)	mV	< 50	**-42**	**-67**	**-18**	**-47**	**-74**	**-20**	**-52**	**-116**
Iron (II), Ferrous(2)	mg/L	> 1	**1.17**	**4.02**	**1.46**	**1.60**	**5.00**	**3.97**	**4.47**	**5.40**

NOTES

(1) From USEPA 1998; These geochemical conditions represent a range that is favorable for reductive dechlorination. The shaded and bold areas indicate results favorable range.

(2) Field Measurement

(3) These values represent two time the background value as per natural attenuati (USEPA, 1998). Average values for alkalinity of groundwater from the Kansas River alluvial deposits is 340 mg/L, with a range of 170-470 mg/L (Fader, 1974). A values for alkalinity of groundwater from the upland aquifer is 408 mg/L, with a ran 376-454 mg/L (LBA, 1996). Therefore, twice the average values are 680 mg/L (all 816 ug/L (terrace).

(4) These values represent two time the background value as per natural attenuati (USEPA, 1996). Average values for chloride of groundwater from the Kansas Rive alluvial deposits is 26 mg/L, with a range of 3.0 - 84 mg/L (Fader, 1974). Average chloride of groundwater from the upland aquifer is 43 mg/L, with a range of 6 - 130 (this report). Therefore, twice the average values are 56 mg/L (alluvial) and 86 mg (terrace).

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Table 6-1 (continued)
Field and Natural Attenuation Parameters
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	B354-99-13b				B354-99-13c			
Sample Date	Units	Conditions[1]	10/1/2001	1/18/2002	4/26/2002	7/12/2002	10/2/2001	1/18/2002	4/26/2002	7/12/2002
Field Stabilization Parameters [2]										
Temperature	°C	>20°C	15.6	13.1	13.9	14.4	14.3	12.6	14.0	14.5
pH	SU	$5 < x < 9$	**6.8**	**7.2**	**6.84**	**6.82**	**7.2**	**7.3**	**7.04**	**7.03**
Conductivity	umhos/cm	NAp	1,400	1,250	120	1,450	1,200	1,050	1,090	906
Turbidity	NTU	NAp	4.74	9.8	7.35	9.00	7.81	21.6	9.46	7.90
Natural Attenuation Parameters										
Methane	ug/L	> 500	2 U	16	18	8	2 U	6	4	6
Ethane	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Ethene	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Alkalinity, as CaCO3	mg/L	> 680 or 816 [3]	499	441	491	442	398	366	419	371
Total Organic Carbon	mg/L	> 20	4.0	3.3	3.4	4.2	2.2	1.8	1.9	1.7
Nitrate, as N	mg/L	< 1	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**
Sulfate	mg/L	< 20	180	160	150	130	130	100	110	120
Sulfide	mg/L	> 1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Chloride	mg/L	> 56 or 86 [4]	**100**	**100**	**100**	**100**	**120**	**120**	**100**	**100**
DO[2]	mg/L	< 0.5	**0.17**	**0.17**	**0.38**	**0.32**	0.73	0.98	**0.34**	**0.33**
Oxidation/Reduction Potential[2]	mV	< 50	**-51**	**-105**	**-56**	**-125**	**-114**	**-125**	**-114**	**-160**
Iron (II), Ferrous[2]	mg/L	> 1	**3.30**	**4.29**	**5.08**	**5.28**	**5.14**	**3.73**	**4.70**	**2.77**

NOTES

(1) From USEPA 1998; These geochemical conditions represent a range that is favorable for reductive dechlorination. The shaded and bold areas indicate results favorable range.

(2) Field Measurement

(3) These values represent two time the background value as per natural attenuatic (USEPA, 1998). Average values for alkalinity of groundwater from the Kansas River alluvial deposits is 340 mg/L, with a range of 170-470 mg/L (Fader, 1974). A values for alkalinity of groundwater from the upland aquifer is 408 mg/L, with a ran 376-454 mg/L (LBA, 1996). Therefore, twice the average values are 680 mg/L (allı 816 ug/L (terrace).

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Table 6-1 (continued)
Field and Natural Attenuation Parameters
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	B354-00-PZ14c				B354-00-PZ19			
Sample Date	Units	Conditions[1]	10/10/2001	1/23/2002	5/1/2002	7/15/2002	10/9/2001	1/21/2002	5/1/2002	7/15/2002
Field Stabilization Parameters [2]										
Temperature	°C	>20°C	**20.8**	7.7	13.8	**21.1**	17.3	8.4	14.2	19.8
pH	SU	5 < x < 9	**7.4**	**7.7**	**6.96**	**7.07**	**7.1**	**7.1**	**6.74**	**6.69**
Conductivity	umhos/cm	NAp	1,140	1,290	1,070	1,340	1,230	1,290	1,040	1,310
Turbidity	NTU	NAp	25.3	3.14	4.65	13.2	6.67	1.87	3.82	5.70
Natural Attenuation Parameters										
Methane	ug/L	> 500	2 U	13	46	31	2 U	23	2 U	50
Ethane	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Ethene	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Alkalinity, as CaCO3	mg/L	> 680 or 816 [3]	502	487	520	504	445	397	433	241
Total Organic Carbon	mg/L	> 20	4.2	2.1	4.4	2.6	3.6	1.9	4.3	2.5
Nitrate, as N	mg/L	< 1	**0.1 UJ**	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 UJ**	**0.1 U**	**0.1**	**0.1 U**
Sulfate	mg/L	< 20	90	100	90	95	73	80	76	65
Sulfide	mg/L	> 1	0.1 U	0.1 U	0.1 U	0.4	0.1 U	0.1 U	0.1 U	0.1 U
Chloride	mg/L	> 56 or 86 [4]	**70**	**70**	**70**	**80**	**120**	**130**	**110**	**120**
DO[2]	mg/L	< 0.5	1.69	**0.35**	**0.28**	1.48	0.99	**0.45**	**0.42**	1.99
Oxidation/Reduction Potential[2]	mV	< 50	**-79**	**-81**	**-66**	**-162**	141	**-7**	50	**-45**
Iron (II), Ferrous[2]	mg/L	> 1	**4.98**	**3.41**	**2.93**	**5.28**	0.25	**1.47**	**1.06**	**1.11**

NOTES

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(2) Field Measurement

(3) These values represent two time the background value as per natural attenuati (USEPA, 1998). Average values for alkalinity of groundwater from the Kansas River alluvial deposits is 340 mg/L, with a range of 170-470 mg/L (Fader, 1974). A values for alkalinity of groundwater from the upland aquifer is 408 mg/L, with a ran 376-454 mg/L (LBA, 1996). Therefore, twice the average values are 680 mg/L (all 816 ug/L (terrace).

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Table 6-1 (continued)
Field and Natural Attenuation Parameters
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	B354-01-19c				B354-00-PZ20			
Sample Date	Units	Conditions(1)	11/15/2001	1/21/2002	5/1/2002	7/16/2002	10/11/2001	1/23/2002	4/30/2002	7/17/2002
Field Stabilization Parameters (2)										
Temperature	°C	>20°C	16.2	12.1	14.4	16.2	18.2	7.6	16.9	**22.8**
pH	SU	5 < x < 9	**7.5**	**7.2**	**6.79**	**6.88**	**6.6**	**7.4**	**6.58**	**6.65**
Conductivity	umhos/cm	NAp	1,200	1,320	1,070	1,370	1,560	1,860	1,590	1,940
Turbidity	NTU	NAp	10.5	15.1	1.56	11.1	12.4	1.71	0.73	0.20
Natural Attenuation Parameters										
Methane	ug/L	> 500	30	7	4	3 J	2 U	2 U	2 U	2 UJ
Ethane	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Ethene	ug/L	> 10	4 U	4 U	4 U	4 UJ	4 U	4 U	4 U	4 UJ
Alkalinity, as CaCO3	mg/L	> 680 or 816 (3)	392	359	409	403	519	510	540	520
Total Organic Carbon	mg/L	> 20	1.6	2.2	3.6	1.2	6.1	4.7	5.9	4.3
Nitrate, as N	mg/L	< 1	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 UJ**	**0.4**	**0.5**	**0.6**	**0.4 J**
Sulfate	mg/L	< 20	80	88	84	88	310	290	300	310
Sulfide	mg/L	> 1	0.1 U	0.1 U	0.1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Chloride	mg/L	> 56 or 86 (4)	**110**	**140**	**140**	**130**	**140**	**130**	**140**	**140**
DO(2)	mg/L	< 0.5	**0.40**	0.68	**0.40**	2.58	1.03	**0.26**	**0.35**	1.04
Oxidation/Reduction Potential(2)	mV	< 50	**-39**	**-217**	**-36**	**-118**	104	55	66	57
Iron (II), Ferrous(2)	mg/L	> 1	**1.44**	**3.75**	**2.03**	**1.97**	0.00	0.12	0.27	0.01

NOTES

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(3) These values represent two time the background value as per natural attenuatic (USEPA, 1998). Average values for alkalinity of groundwater from the Kansas River alluvial deposits is 340 mg/L, with a range of 170-470 mg/L (Fader, 1974). A values for alkalinity of groundwater from the upland aquifer is 408 mg/L, with a rang 376-454 mg/L (LBA, 1996). Therefore, twice the average values are 680 mg/L (allu 816 ug/L (terrace).

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Table 6-1 (continued)
Field and Natural Attenuation Parameters
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	B354-01-20c				B354-01-24			
Sample Date	Units	Conditions[(1)]	10/11/2001	1/23/2002	4/30/2002	7/16/2002	10/9/2001	1/18/2002	5/1/2002	7/11/2002
Field Stabilization Parameters [(2)]										
Temperature	°C	>20°C	18.0	13.6	15.2	15.3	18.6	12.4	14.9	**20.2**
pH	SU	5 < x < 9	**7.2**	**7.1**	**6.68**	**6.96**	**8.9**	9.4	**7.48**	**7.63**
Conductivity	umhos/cm	NAp	1,420	1,650	1,340	1,720	960	1,140	1,000	858
Turbidity	NTU	NAp	10.7	13.2	2.51	0.20	13.4	11.6	7.05	9.10
Natural Attenuation Parameters										
Methane	ug/L	> 500	2 U	2 U	2 U	2 UJ	2 U	2 U	2 U	2 U
Ethane	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Ethene	ug/L	> 10	4 U	4 U	4 U	4 UJ	4 U	4 U	4 U	4 U
Alkalinity, as CaCO3	mg/L	> 680 or 816 [(3)]	465	436	480	473	179	149	240	220
Total Organic Carbon	mg/L	> 20	4.8	3.0	4.3	2.4	1.3	0.5 U	1.8	0.7
Nitrate, as N	mg/L	< 1	1.8	**0.7**	**0.4**	**0.1 UJ**	**0.1 J**	**0.1**	**0.2**	**0.2**
Sulfate	mg/L	< 20	220	210	190	190	360	380	370	370
Sulfide	mg/L	> 1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Chloride	mg/L	> 56 or 86 [(4)]	**150**	**160**	**150**	**180**	34	36	40	34
DO[(2)]	mg/L	< 0.5	**0.24**	**0.02**	**0.36**	**0.34**	1.13	**0.32**	3.95	3.57
Oxidation/Reduction Potential[(2)]	mV	< 50	**-32**	**-48**	**-39**	**-125**	**33**	**-34**	108	131
Iron (II), Ferrous[(2)]	mg/L	> 1	**1.10**	**2.62**	**3.18**	**5.24**	0.09	0.02	0.01	0.03

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Table 6-1 (continued)
Field and Natural Attenuation Parameters
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	B354-01-25				B354-01-26			
Sample Date	Units	Conditions(1)	10/5/2001	1/21/2002	4/26/2002	7/12/2002	10/5/2001	1/18/2002	5/1/2002	7/12/2002
Field Stabilization Parameters (2)										
Temperature	°C	>20°C	14.8	17.0	14.7	16.8	16.0	6.1	15.3	18.0
pH	SU	5 < x < 9	**6.8**	**7.1**	**6.71**	**6.82**	**7.1**	**7.5**	**6.76**	**6.50**
Conductivity	umhos/cm	NAp	2,900	3,300	2,890	3,170	1,140	1,210	1,020	1,090
Turbidity	NTU	NAp	26.6	8.35	1.27	1.50	80.8	98.4	1.99	4.40
Natural Attenuation Parameters										
Methane	ug/L	> 500	2 U	131	179	40	2 U	2 U	2 U	2 UJ
Ethane	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Ethene	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 UJ
Alkalinity, as CaCO3	mg/L	> 680 or 816 (3)	389	374	429	372	330	275	325	276
Total Organic Carbon	mg/L	> 20	3.3	2.7	3.1	2.7	2.3	1.2	2.6	1.1
Nitrate, as N	mg/L	< 1	4.2 J	14.8	13.7	1.9	4.2 J	5.1	4.9	6.3
Sulfate	mg/L	< 20	250	230	210	230	120	74	110	95
Sulfide	mg/L	> 1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Chloride	mg/L	> 56 or 86 (4)	**610**	**700**	**700**	**600**	**130**	**130**	**110**	**130**
DO(2)	mg/L	< 0.5	0.76	0.61	**0.34**	**0.45**	4.19	5.20	6.31	5.34
Oxidation/Reduction Potential(2)	mV	< 50	104	58	128	**-20**	182	125	210	251
Iron (II), Ferrous(2)	mg/L	> 1	0.00	0.21	0.14	0.24	0.06	0.26	0.03	0.06

NOTES

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Table 6-1 (continued)
Field and Natural Attenuation Parameters
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	B354-01-27				B354-01-28			
Sample Date	Units	Conditions(1)	10/5/2001	1/22/2002	5/1/2002	7/12/2002	10/8/2001	1/23/2002	5/2/2002	7/12/2002
Field Stabilization Parameters (2)										
Temperature	°C	>20°C	16.7	17.8	16.9	18.2	19.4	5.5	15.0	16.5
pH	SU	5 < x < 9	**7.2**	**7.4**	**6.90**	**6.84**	**7.0**	**7.5**	**6.59**	**6.68**
Conductivity	umhos/cm	NAp	980	1,120	1,010	1,080	820	940	730	833
Turbidity	NTU	NAp	20.7	27.1	7.87	7.40	15.1	28.3	25.5	10.9
Natural Attenuation Parameters										
Methane	ug/L	> 500	2 U	2 U	2 U	2 UJ	2 U	2 U	2 U	2 U
Ethane	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Ethene	ug/L	> 10	4 U	4 U	4 U	4 UJ	4 U	4 U	4 U	4 U
Alkalinity, as CaCO3	mg/L	> 680 or 816 (3)	403	397	414	381	396	386	415	373
Total Organic Carbon	mg/L	> 20	2.6	1.8	3.5	1.1	3.0	0.9	2.4	1.0
Nitrate, as N	mg/L	< 1	6.7 J	9.9	9.5	9.7	**0.9**	1.1	1.1	1.2
Sulfate	mg/L	< 20	74	83	70	79	48	47	46	47
Sulfide	mg/L	> 1	0.1 U	0.1 U	0.1U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Chloride	mg/L	> 56 or 86 (4)	69	70	50	70	25	24	28	32
DO(2)	mg/L	< 0.5	3.61	3.76	5.87	4.55	5.22	4.97	6.66	4.61
Oxidation/Reduction Potential(2)	mV	< 50	144	102	187	259	143	176	173	295
Iron (II), Ferrous(2)	mg/L	> 1	0.08	0.04	0.03	0.19	0.00	0.70	0.00	0.07

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354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	B354-01-29c				B354-01-30c			
Sample Date	Units	Conditions(1)	10/8/2001	1/17/2002	4/30/2002	7/16/2002	10/8/2001	1/22/2002	5/2/2002	7/15/2002
Field Stabilization Parameters (2)										
Temperature	°C	>20°C	18.2	14.3	16.4	16.9	18.1	14.2	14.0	14.8
pH	SU	5 < x < 9	**6.8**	**6.9**	**6.56**	**6.66**	**7.1**	**7.4**	**6.93**	**7.12**
Conductivity	umhos/cm	NAp	2,300	1,760	2,350	2,560	1,080	750	1,020	817
Turbidity	NTU	NAp	20.8	17.6	1.78	1.70	63.8	22.2	26.1	24.8
Natural Attenuation Parameters										
Methane	ug/L	> 500	2 U	38	34	10 J	2 U	7	5	6
Ethane	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Ethene	ug/L	> 10	4 U	4 U	4 U	4 UJ	4 U	4 U	4 U	4 U
Alkalinity, as CaCO3	mg/L	> 680 or 816 (3)	553	529	551	517	404	404	412	395
Total Organic Carbon	mg/L	> 20	7.2	3.6	5.7	3.4	4.7	1.8	3.6	1.7
Nitrate, as N	mg/L	< 1	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 UJ**	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**
Sulfate	mg/L	< 20	210	150	190	220	140	130	120	120
Sulfide	mg/L	> 1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Chloride	mg/L	> 56 or 86 (4)	**400**	**350**	**400**	**400**	**67**	**60**	**60**	50
DO(2)	mg/L	< 0.5	0.76	**0.25**	1.00	**0.44**	**0.25**	**0.04**	**0.40**	**0.37**
Oxidation/Reduction Potential(2)	mV	< 50	**5**	**42**	**9**	**-6.0**	**-74**	**-79**	**-22**	**-89**
Iron (II), Ferrous(2)	mg/L	> 1	0.42	0.54	0.41	**1.86**	**1.04**	**1.37**	0.79	**1.16**

NOTES

(1) From USEPA 1998; These geochemical conditions represent a range that is favorable for reductive dechlorination. The shaded and bold areas indicate results favorable range.

(2) Field Measurement

(3) These values represent two time the background value as per natural attenuatic (USEPA, 1998). Average values for alkalinity of groundwater from the Kansas River alluvial deposits is 340 mg/L, with a range of 170-470 mg/L (Fader, 1974). A values for alkalinity of groundwater from the upland aquifer is 408 mg/L, with a ran 376-454 mg/L (LBA, 1996). Therefore, twice the average values are 680 mg/L (all 816 ug/L (terrace).

(4) These values represent two time the background value as per natural attenuatic (USEPA, 1998). Average values for chloride of groundwater from the Kansas Rive alluvial deposits is 28 mg/L, with a range of 3.0 - 84 mg/L (Fader, 1974). Average chloride of groundwater from the upland aquifer is 43 mg/L, with a range of 6 - 130 (this report). Therefore, twice the average values are 56 mg/L (alluvial) and 86 mg (terrace).

mg/L - milligrams per liter
ug/L - micrograms per liter
°C - degrees Celsius
mV - millivolts
NTU - Nephelometric turbidity units
U - Qualified as undetected by the laboratory
umhos/cm - micromhos per centimeter

NA - Not Analyzed
NAp - Not Applicable
J - Estimated
NS - Not Sampled
DO - Dissolved Oxygen
SU - standard units

Table 6-1 (continued)
Field and Natural Attenuation Parameters
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	B354-01-31				B354-01-31c			
Sample Date	Units	Conditions$^{(1)}$	10/10/2001	1/22/2002	5/2/2002	7/16/2002	10/10/2001	1/22/2002	5/2/2002	7/16/2002
Field Stabilization Parameters $^{(2)}$										
Temperature	°C	>20°C	15.4	14.9	14.4	15.8	15.1	14.6	13.9	15.1
pH	SU	5 < x < 9	**7.1**	**7.4**	**6.86**	**7.28**	**7.1**	**7.3**	**6.79**	**7.27**
Conductivity	umhos/cm	NAp	1,450	1,150	1,310	1,730	1,600	950	1,580	1,570
Turbidity	NTU	NAp	9.13	0.92	5.32	11.2	8.92	2.47	1.67	17.6
Natural Attenuation Parameters										
Methane	ug/L	> 500	2 U	5	3	2 UJ	2 U	2	2	8 J
Ethane	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Ethene	ug/L	> 10	4 U	4 U	4 U	4 UJ	4 U	4 U	4 U	4 UJ
Alkalinity, as CaCO3	mg/L	> 680 or 816 $^{(3)}$	395	363	365	392	396	401	405	395
Total Organic Carbon	mg/L	> 20	4.5	2.2	3.8	2.8	2.8	1.1	3.4	1.1
Nitrate, as N	mg/L	< 1	**0.1 UJ**	**0.1 U**	**0.1 U**	**0.1 UJ**	**0.1 UJ**	**0.1 U**	**0.1 U**	**0.1 UJ**
Sulfate	mg/L	< 20	100	83	78	81	110	110	110	110
Sulfide	mg/L	> 1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Chloride	mg/L	> 56 or 86 $^{(4)}$	**280**	**340**	**260**	**270**	**340**	**250**	**220**	**200**
DO$^{(2)}$	mg/L	< 0.5	1.61	**0.26**	**0.39**	1.90	2.21	**0.05**	**0.43**	1.82
Oxidation/Reduction Potential$^{(2)}$	mV	< 50	**-73**	**-67**	**6**	**-89**	**-97**	**-150**	**-100**	**-137**
Iron (II), Ferrous$^{(2)}$	mg/L	> 1	**1.66**	**2.68**	**1.23**	**2.43**	**2.74**	**6.42**	**1.11**	**6.46**

NOTES

(1) From USEPA 1998; These geochemical conditions represent a range that is favorable for reductive dechlorination. The shaded and bold areas indicate results favorable range.

(2) Field Measurement

(3) These values represent two time the background value as per natural attenuatic (USEPA, 1998). Average values for alkalinity of groundwater from the Kansas River alluvial deposits is 340 mg/L, with a range of 170-470 mg/L (Fader, 1974). A values for alkalinity of groundwater from the upland aquifer is 408 mg/L, with a ran 376-454 mg/L (LBA, 1996). Therefore, twice the average values are 680 mg/L (allu 816 ug/L (terrace).

(4) These values represent two time the background value as per natural attenuatic (USEPA, 1998). Average values for chloride of groundwater from the Kansas Rive alluvial deposits is 28 mg/L, with a range of 3.0 - 84 mg/L (Fader, 1974). Average chloride of groundwater from the upland aquifer is 43 mg/L, with a range of 6 - 130 (this report). Therefore, twice the average values are 56 mg/L (alluvial) and 86 mg (terrace).

mg/L - milligrams per liter
ug/L - micrograms per liter
°C - degrees Celsius
mV - millivolts
NTU - Nephelometric turbidity units
U - Qualified as undetected by the laboratory
umhos/cm - micromhos per centimeter

NA - Not Analyzed
NAp - Not Applicable
J - Estimated
NS - Not Sampled
DO - Dissolved Oxygen
SU - standard units

Table 6-1 (continued)
Field and Natural Attenuation Parameters
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	MPL94-01				MPL94-02			
Sample Date	Units	Conditions(1)	9/26/2001	1/17/2002	4/25/2002	7/11/2002	10/2/2001	1/17/2002	4/25/2002	7/11/2002
Field Stabilization Parameters (2)										
Temperature	°C	>20°C	16.2	11.7	13.7	14.5	15.7	10.9	14.8	15.2
pH	SU	5 < x < 9	**7.0**	**6.5**	**6.63**	**6.67**	**6.8**	**6.5**	**6.41**	**6.88**
Conductivity	umhos/cm	NAp	1,500	1,570	1,360	1,570	1,800	1,660	1,470	1,740
Turbidity	NTU	NAp	5.50	3.37	1.53	1.40	6.70	2.70	1.11	4.60
Natural Attenuation Parameters										
Methane	ug/L	> 500	2 U	9	4	6	2 U	3	5	6
Ethane	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Ethene	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Alkalinity, as CaCO3	mg/L	> 680 or 816 (3)	509	505	567	513	597	470	561	474
Total Organic Carbon	mg/L	> 20	3.6	5.0	4.4	4.8	3.5	3.4	3.2	4.7
Nitrate, as N	mg/L	< 1	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**	**0.1 U**
Sulfate	mg/L	< 20	200	180	190	200	250	160	160	150
Sulfide	mg/L	> 1	0.1 U	0.1 UJ	0.1 U	0.1 U	0.1 U	0.1 J	0.1 U	0.1 U
Chloride	mg/L	> 56 or 86 (4)	**100**	**100**	**100**	**100**	**200**	**120**	**140**	**160**
DO(2)	mg/L	< 0.5	**0.31**	**0.31**	**0.45**	0.99	1.17	1.47	**0.29**	**0.34**
Oxidation/Reduction Potential(2)	mV	< 50	**-42**	**-79**	**-20**	**-107**	**-84**	**-193**	**-30**	**-141**
Iron (II), Ferrous(2)	mg/L	> 1	**5.30**	**4.36**	**2.45**	**5.48**	**6.86**	**3.75**	**3.29**	**3.27**

NOTES

(1) From USEPA 1998; These geochemical conditions represent a range that is favorable for reductive dechlorination. The shaded and bold areas indicate results favorable range.

(2) Field Measurement

(3) These values represent two time the background value as per natural attenuati (USEPA, 1998). Average values for alkalinity of groundwater from the Kansas River alluvial deposits is 340 mg/L, with a range of 170-470 mg/L (Fader, 1974). A values for alkalinity of groundwater from the upland aquifer is 408 mg/L, with a ran 376-454 mg/L (LBA, 1996). Therefore, twice the average values are 680 mg/L (all 816 ug/L (terrace).

(4) These values represent two time the background value as per natural attenuati (USEPA, 1998). Average values for chloride of groundwater from the Kansas Rive alluvial deposits is 28 mg/L, with a range of 3.0 - 84 mg/L (Fader, 1974). Average chloride of groundwater from the upland aquifer is 43 mg/L, with a range of 6 - 130 (this report). Therefore, twice the average values are 56 mg/L (alluvial) and 88 mg (terrace).

mg/L	milligrams per liter
ug/L	micrograms per liter
°C	degrees Celsius
mV	millivolts
NTU	Nephelometric turbidity units
U	Qualified as undetected by the laboratory
umhos/cm	micromhos per centimeter

NA	Not Analyzed
NAp	Not Applicable
J	Estimated
NS	Not Sampled
DO	Dissolved Oxygen
SU	standard units

Table 6-1 (continued)
Field and Natural Attenuation Parameters
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	MPL94-03				PZ-A			
Sample Date	Units	Conditions(1)	10/2/2001	1/22/2002	4/25/2002	7/11/2002	10/4/2001	1/17/2002	4/29/2002	NS
Field Stabilization Parameters (2)										
Temperature	°C	>20°C	15.5	13.2	14.3	14.1	**20.8**	13.5	14.9	**23.6**
pH	SU	5 < x < 9	**6.8**	**7.1**	**6.42**	**6.67**	**7.2**	**7.2**	**7.8**	NS
Conductivity	umhos/cm	NAp	2,200	1,230	1,430	1,570	1,900	2,100	1,820	NS
Turbidity	NTU	NAp	4.11	0.51	0.52	7.00	NA	176	NA	NA
Natural Attenuation Parameters										
Methane	ug/L	> 500	2 U	7	3	5	NA	NA	NA	NS
Ethane	ug/L	> 10	4 U	4 U	4 U	4 U	NA	NA	NA	NS
Ethene	ug/L	> 10	4 U	4 U	4 U	4 U	NA	NA	NA	NS
Alkalinity, as CaCO3	mg/L	> 680 or 816 (3)	**760**	551	585	533	NA	NA	NA	NS
Total Organic Carbon	mg/L	> 20	9.4	5.1	6.7	5.3	NA	NA	NA	NS
Nitrate, as N	mg/L	< 1	**0.3**	**0.1 U**	**0.3**	**0.1**	NA	NA	NA	NS
Sulfate	mg/L	< 20	420	190	190	190	NA	NA	NA	NS
Sulfide	mg/L	> 1	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA	NA	NS
Chloride	mg/L	> 56 or 86 (4)	**140**	**90**	**100**	**100**	NA	NA	NA	NS
DO(2)	mg/L	< 0.5	1.23	0.97	0.52	0.94	NA	NA	NA	NS
Oxidation/Reduction Potential(2)	mV	< 50	**-4**	**21**	234	102	NA	NA	NA	NS
Iron (II), Ferrous(2)	mg/L	> 1	0.14	0.34	0.03	0.14	NA	NA	NA	NS

NOTES

(1) From USEPA 1998; These geochemical conditions represent a range that is favorable for reductive dechlorination. The shaded and bold areas indicate results favorable range.

(2) Field Measurement

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(4) These values represent two time the background value as per natural attenuati (USEPA, 1998). Average values for chloride of groundwater from the Kansas Rive alluvial deposits is 28 mg/L, with a range of 3.0 - 84 mg/L (Fader, 1974). Average chloride of groundwater from the upland aquifer is 43 mg/L, with a range of 6 - 130 (this report). Therefore, twice the average values are 56 mg/L (alluvial) and 86 mg (terrace).

mg/L - milligrams per liter
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Table 6-1 (continued)
Field and Natural Attenuation Parameters
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	PZ-B				PZ-C			
Sample Date	Units	Conditions[1]	NA	NS	NS	NS	10/3/2001	1/17/2002	4/29/2002	7/11/2002
Field Stabilization Parameters [2]										
Temperature	°C	>20°C	NS	NS	NS	NS	16.6	12.8	16.9	17.4
pH	SU	5 < x < 9	NS	NS	NS	NS	**6.7**	**6.6**	**7.0**	**6.89**
Conductivity	umhos/cm	NAp	NS	NS	NS	NS	2,000	2,300	2,000	2,190
Turbidity	NTU	NAp	NS	NS	NS	NS	175	357	27.7	71.3
Natural Attenuation Parameters										
Methane	ug/L	> 500	NS	NS	NS	NS	2 U	2 U	2 U	2 U
Ethane	ug/L	> 10	NS	NS	NS	NS	4 U	4 U	4 U	4 U
Ethene	ug/L	> 10	NS	NS	NS	NS	4 U	4 U	4 U	4 U
Alkalinity, as CaCO3	mg/L	> 680 or 816 [3]	NS	NS	NS	NS	434	406	433	393
Total Organic Carbon	mg/L	> 20	NS	NS	NS	NS	2.1	16.4	3.9	2.0
Nitrate, as N	mg/L	< 1	NS	NS	NS	NS	11.4	11.6	9.3	9.7
Sulfate	mg/L	< 20	NS	NS	NS	NS	160	140	160	170
Sulfide	mg/L	> 1	NS	NS	NS	NS	0.1 U	0.1 UJ	0.1 U	0.1 U
Chloride	mg/L	> 56 or 86 [4]	NS	NS	NS	NS	**360**	**340**	**300**	**350**
DO[2]	mg/L	< 0.5	NS	NS	NS	NS	6.07	NA	NA	NA
Oxidation/Reduction Potential[2]	mV	< 50	NS	NS	NS	NS	158	NA	NA	NA
Iron (II), Ferrous[2]	mg/L	> 1	NS	NS	NS	NS	0.40	0.17	0.04	0.21

NOTES

(1) From USEPA 1998; These geochemical conditions represent a range that is
favorable for reductive dechlorination. The shaded and bold areas indicate results
favorable range.

(2) Field Measurement

(3) These values represent two time the background value as per natural attenuatic
(USEPA, 1998). Average values for alkalinity of groundwater from the Kansas
River alluvial deposits is 340 mg/L, with a range of 170-470 mg/L (Fader, 1974). A
values for alkalinity of groundwater from the upland aquifer is 408 mg/L, with a ran
376-454 mg/L (LBA, 1996). Therefore, twice the average values are 680 mg/L (allı
816 ug/L (terrace).

(4) These values represent two time the background value as per natural attenuatic
(USEPA, 1998). Average values for chloride of groundwater from the Kansas Rive
alluvial deposits is 28 mg/L, with a range of 3.0 - 84 mg/L (Fader, 1974). Average
chloride of groundwater from the upland aquifer is 43 mg/L, with a range of 6 - 130
(this report). Therefore, twice the average values are 56 mg/L (alluvial) and 86 mg
(terrace).

mg/L - milligrams per liter
ug/L - micrograms per liter
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NA - Not Analyzed
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Table 6-1 (continued)
Field and Natural Attenuation Parameters
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	PZ-D				PSF92-01			
Sample Date	Units	Conditions(1)	10/3/2001	1/17/2002	4/29/2002	7/11/2002	9/26/2001	1/15/2002	4/23/2002	7/9/2002
Field Stabilization Parameters (2)										
Temperature	°C	>20°C	**22.2**	15.4	18.3	18.2	18.9	9.7	16.4	**21.7**
pH	SU	5 < x < 9	**7.2**	**7.1**	**7.1**	**7.20**	**6.8**	**7.6**	**6.48**	**6.78**
Conductivity	umhos/cm	NAp	1,000	1,270	1,430	989	1,000	1,100	950	1,240
Turbidity	NTU	NAp	229	>1,000	527	59.6	13.40	9.64	1.24	5.30
Natural Attenuation Parameters										
Methane	ug/L	> 500	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Ethane	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Ethene	ug/L	> 10	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Alkalinity, as CaCO3	mg/L	> 680 or 816 (3)	339	482	400	371	173	248	200	179
Total Organic Carbon	mg/L	> 20	1.8	2.2	4.3	3.0	1.2	1.2	1	1.0
Nitrate, as N	mg/L	< 1	8.8	9.1	15.3	11	**0.1**	3.4	2.2	1.6
Sulfate	mg/L	< 20	71	75	63	79	370	240	390	450
Sulfide	mg/L	> 1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U	0.1 U
Chloride	mg/L	> 56 or 86 (4)	**140**	**120**	**160**	**180**	6	24	14	10
DO(2)	mg/L	< 0.5	4.67	NA	NA	NA	2.40	6.99	5.20	3.08
Oxidation/Reduction Potential(2)	mV	< 50	**-18**	NA	NA	NA	171	175	112	185
Iron (II), Ferrous(2)	mg/L	> 1	0.58	NA	0.10	0.34	0.02	0.00	0.04	0.07

NOTES

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Table 6-1 (continued)
Field and Natural Attenuation Parameters
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Sample Location		Geochemical	PSF92-05			
Sample Date	Units	Conditions[1]	9/27/2001	1/18/2002	4/30/2002	7/11/2002
Field Stabilization Parameters [2]						
Temperature	°C	>20°C	17.7	12.0	14.8	15.1
pH	SU	5 < x < 9	**7.1**	**7.1**	**6.55**	**6.59**
Conductivity	umhos/cm	NAp	1,000	1,200	1,140	850
Turbidity	NTU	NAp	4.76	13.4	1.89	4.80
Natural Attenuation Parameters						
Methane	ug/L	> 500	2 U	2 U	2 U	2 U
Ethane	ug/L	> 10	4 U	4 U	4 U	4 U
Ethene	ug/L	> 10	4 U	4 U	4 U	4 U
Alkalinity, as CaCO3	mg/L	> 680 or 816 [3]	318	345	440	368
Total Organic Carbon	mg/L	> 20	0.9	1.4	3.8	2.8
Nitrate, as N	mg/L	< 1	10.6	11.5	12.1	12.6
Sulfate	mg/L	< 20	93	110	110	110
Sulfide	mg/L	> 1	0.1 U	0.1 U	0.1 U	0.1 U
Chloride	mg/L	> 56 or 86 [4]	**90**	**70**	**60**	**60**
DO[2]	mg/L	< 0.5	5.16	3.65	4.89	3.31
Oxidation/Reduction Potential[2]	mV	< 50	221	220	180	126
Iron (II), Ferrous[2]	mg/L	> 1	0.09	0.26	0.01	0.03

NOTES

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favorable for reductive dechlorination. The shaded and bold areas indicate results
favorable range.

(2) Field Measurement

(3) These values represent two time the background value as per natural attenuatic
(USEPA, 1998). Average values for alkalinity of groundwater from the Kansas
River alluvial deposits is 340 mg/L, with a range of 170-470 mg/L (Fader, 1974). A
values for alkalinity of groundwater from the upland aquifer is 408 mg/L, with a ran
376-454 mg/L (LBA, 1996). Therefore, twice the average values are 680 mg/L (all
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(4) These values represent two time the background value as per natural attenuatic
(USEPA, 1998). Average values for chloride of groundwater from the Kansas Rive
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°C - degrees Celsius
mV - millivolts
NTU - Nephelometric turbidity units
U - Qualified as undetected by the laboratory
umhos/cm - micromhos per centimeter

NA - Not Analyzed
NAp - Not Applicable
J - Estimated
NS - Not Sampled
DO - Dissolved Oxygen
SU - standard units

Table 7-1
Summary of Area-Specific Data Sets
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Building 354/332/DPW Compound Area					
Surface Soil (0-1 ft bgs)		**Deep Subsurface Soil (11-30 ft bgs)**		**Groundwater (14-32 ft bgs)**	
B163	B170	Bldg354/SB-2A	Bldg354/SB-12N	B354-99-09	TSO292-01
B164	B171	Bldg354/SB-2B	Bldg354/SB-12O	MW95-06	TSO292-02
		Bldg354/SB-12H	B172		

Building 367 Area					
Shallow Subsurface Soil (0-10 ft bgs)					**Groundwater (52-57 ft bgs)**
B2144S	B2325S	B2337S	B2350S	B2370S	B354-99-08
B2183S	B2333S	B2344S	B2358S		B354-00-10
B2203S	B2335S	B2345S	B2360S		
B2322S	B2336S	B2347S	B2369S		

Building 430 Area									
Surface Soil (0-1 ft bgs)		**Soil-Gas (9 ft bgs)**							**Groundwater (59 ft bgs)**
B888S	B916S	B-864	B-901	B-927	B-959	B-1026	B-1038	B-1056	B354-01-26
B902S	B918S	B-874	B-902	B-933	B-960	B-1027	B-1039	B-1057	
		B-875	B-903	B-934	B-961	B-1028	B-1040	B-1058	
		B-876	B-913	B-935	B-972	B-1029	B-1041	B-1059	
		B-885	B-914	B-936	B-973	B-1030	B-1042	B-1060	
		B-886	B-915	B-937	B-974	B-1031	B-1045	B-1061	
		B-887	B-916	B-943	B-975	B-1032	B-1046	B-1062	
		B-888	B-917	B-944	B-987	B-1033	B-1047		
		B-889	B-918	B-945	B-1022	B-1034	B-1048		
		B-898	B-924	B-946	B-1023	B-1035	B-1050		
		B-899	B-925	B-957	B-1024	B-1036	B-1051		
		B-900	B-926	B-958	B-1025	B-1037	B-1055		

Point Bar Area					
Groundwater (12-29 ft bgs)					
MW95-03	B354-99-12c	B354-00-PZ19	B354-01-29c	PZ-C	MPL94-02
MW95-04	B354-99-13b	B354-01-19c	B354-01-30c	PZ-D	MPL94-03
B354-99-12	B354-99-13c	B354-00-PZ20	B354-01-31	PSF92-05	
B354-99-12b	B354-00-PZ14c	B354-01-20c	B354-01-31c	MPL94-01	

Notes:
ft = feet
bgs = below ground surface

Table 7-2
Shallow Subsurface Soil Data Summary
Building 367 Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Number of Detections / Number of Samples	Percent Positive Detections	Range of Detected Concentrations	Location of Maximum Detection
PAHs (mg/kg)				
Acenaphthylene	1 / 68	2%	0.20	B2370S-SB01
Benzo(a)anthracene	22 / 68	32%	0.01 - 0.13	B2360S-SB01
Benzo(a)pyrene	20 / 68	29%	0.01 - 0.12	B2360S-SB01
Benzo(b)fluoranthene	24 / 68	35%	0.01 - 0.20	B2347S-SB-11 B2347S-SB-11
Benzo(g,h,i)perylene	23 / 68	34%	0.01 - 0.10	B2144S-SB01
Benzo(k)fluoranthene	9 / 68	13%	0.01 - 0.06	B2360S-SB01
Chrysene	25 / 68	37%	0.01 - 0.60	B2144S-SB03
Dibenz(a,h)anthracene	5 / 68	7%	0.01 - 0.06	B2347S-SB-11
Fluoranthene	19 / 68	28%	0.02 - 0.27	B2360S-SB01
Indeno(1,2,3-cd)pyrene	10 / 68	15%	0.01 - 0.08	B2360S-SB01
Naphthalene	1 / 68	2%	0.10	B2325S-SB01
Phenanthrene	6 / 35	17%	0.08 - 0.80	B2144S-SB02
Pyrene	19 / 68	28%	0.02 - 0.24	B2360S-SB01
Volatiles (ug/kg)				
Acetone	4 / 68	6%	110 - 220	B2360S-SB01
Carbon disulfide	2 / 68	4%	6.10 - 7.00	B2336S-SB01
cis-1,2-Dichloroethene	43 / 68	63%	6.30 - 8120	B2337S-SB01
Tetrachloroethene	62 / 68	91%	6.40 - 29000	B2335S-SB11R
trans-1,2-Dichloroethene	8 / 68	12%	6.20 - 58.4	B2337S-SB01
Trichloroethene	34 / 68	50%	6.70 - 756	B2335S-SB01
m,p-Xylene	1 / 68	2%	6.40	B2144S-SB01

Notes:
Data set includes 2001 data collected from 0-10 feet below ground surface.
Includes only those chemicals that were detected in at least one sample.
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram

Table 7-3
Groundwater Data Summary
Building 367 Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Number of Detects/ Number of Samples	Percent Positive Detects	Range of Detected Concentrations			Location of Maximum Concentration	Sample Date
Volatiles (ug/L)							
1,1,2-Trichloroethane	1 / 6	17%	0.7			B354-99-08	March 2001
Carbon tetrachloride	6 / 6	100%	2.6	-	3.8	B354-99-08	July 2002
Chloroform	6 / 6	100%	1.4	-	2.2	B354-99-08	March 2001 & September 2001
cis-1,2-Dichloroethene	6 / 6	100%	41	-	150	B354-99-08	September 2001
Tetrachloroethene	6 / 6	100%	404	-	1640	B354-99-08	September 2001
trans-1,2-Dichloroethene	6 / 6	100%	0.6	-	1.6	B354-99-08	September 2001
Trichloroethene	6 / 6	100%	24	-	65.1	B354-99-08	September 2001
Vinyl chloride	1 / 6	17%	0.9			B354-00-10	October 2000

Notes:
Data set for all chemicals except vinyl chloride includes data collected from Monitoring Well B354-99-08 during sampling events from 10/00 through 7/02.
Data set for vinyl chloride includes data collected from Monitoring Well B354-00-10 during sampling events from 10/00 through 7/02.
Includes only those chemicals that were detected in at least one sample.
ug/L - micrograms per Liter

Table 7-4
Surface Soil Data Summary
Building 354/332/DPW Compound Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Number of Detects/ Number of Samples	Percent Positive Detects	Range of Detected Concentrations	Location of Maximum Concentration
PAHs (mg/kg)				
Benzo(a)anthracene	3 / 4	75%	0.02 - 0.4	B163/SB01
Benzo(a)pyrene	3 / 4	75%	0.02 - 0.2	B163/SB01
Benzo(b)fluoranthene	3 / 4	75%	0.02 - 0.4	B163/SB01
Benzo(g,h,i)perylene	3 / 4	75%	0.04 - 0.2	B163/SB01
Benzo(k)fluoranthene	2 / 4	50%	0.04 - 0.2	B163/SB01
Chrysene	3 / 4	75%	0.02 - 0.4	B163/SB01
Dibenz(a,h)anthracene	1 / 4	25%	0.08	B163/SB01
Fluoranthene	3 / 4	75%	0.04 - 0.94	B163/SB01
Indeno(1,2,3-cd)pyrene	3 / 4	75%	0.02 - 0.2	B163/SB01
Phenanthrene	1 / 4	25%	0.71	B163/SB01
Pyrene	3 / 4	75%	0.03 - 0.77	B163/SB01

Notes:
Data set includes 2001 data collected from 0-1 ft. bgs in unpaved areas.
Includes only those chemicals that were detected in at least one sample.
mg/kg - milligrams per kilogram
ft - feet
bgs - below ground surface

Table 7-5
Deep Subsurface Soil Data Summary
Building 354/332/DPW Compound Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Number of Detects/ Number of Samples	Percent Positive Detects	Range of Detected Concentrations	Location of Maximum Concentration
Volatiles (ug/kg)				
Benzene	1 / 5	20%	124	B172/SB07
Ethylbenzene	3 / 5	60%	1,900 - 7,400	B172/SB07
Toluene	3 / 5	60%	99 - 220	Bldg354/SB-12N
Xylenes, total	4 / 5	80%	440 - 39,000	Bldg354/SB-12N

Notes:
Data set includes 2001 and 1995 data collected from 11-30 ft. bgs which had detections of volatiles.
Includes only those chemicals that were detected in at least one sample.
Analytical data from 1995 reported total xylenes, but analytical data from 2001 reported m,p-xylenes and o-xylenes. To establish a consistent data set, the 2001 data for m,p- and o-xylenes were combined and evaluated as total xylenes.
ug/kg - micrograms per kilogram
mg/kg - milligrams per kilogram
Bldg - building
ft - feet
bgs - below ground surface

Table 7-6
Groundwater Data Summary
Building 354/332/DPW Compound Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Number of Detects/ Number of Samples	Percent Positive Detects	Range of Detected Concentrations	Location of Maximum Concentration	Sample Date
Volatiles (ug/L)					
Benzene	10 / 18	56%	0.4 - 40.3	TSO292-02	July 2002
Carbon tetrachloride	12 / 18	67%	0.7 - 2.4	MW95-06	March 2001 & April 2002
Chloroform	12 / 18	67%	0.7 - 1.5	MW95-06	March 2001
cis-1,2-Dichloroethene	11 / 18	61%	0.7 - 19.2	TSO202-02	January 2002
Ethylbenzene	8 / 18	44%	1.3 - 8.5	TSO292-02	April 2002
Tetrachloroethene	12 / 18	67%	27.9 - 95.2	MW95-06	October 2000
Toluene	8 / 18	44%	1.1 - 2.7	TSO292-02	April 2002
trans-1,2-Dichloroethene	6 / 18	33%	0.6 - 1.7	TSO292-02	October 2001
Trichloroethene	12 / 18	67%	1.3 - 3.6	TSO292-01	October 2000 & March 2001
m,p-Xylene	8 / 18	44%	2.0 - 8.7	TSO292-02	April 2002
o-Xylene	6 / 18	33%	0.6 - 1.2	TSO292-02	April 2002

Notes:
Includes data collected from monitoring wells TSO292-01, TSO292-02, and MW95-06 during sampling events from 10/00 through 7/02.
Includes only those chemicals that were detected in at least one sample.
ug/L - micrograms per Liter
MW - Monitoring Well

Table 7-7
Surface Soil Data Summary
Building 430 Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Number of Detects/ Number of Samples	Percent Positive Detects	Range of Detected Concentrations	Location of Maximum Concentration
PAHs (mg/kg)				
Benzo(a)anthracene	3 / 4	75%	0.03 - 0.12	B916S
Benzo(a)pyrene	3 / 4	75%	0.03 - 0.1	B916S
Benzo(b)fluoranthene	3 / 4	75%	0.04 - 0.12	B916S
Benzo(g,h,i)perylene	3 / 4	75%	0.02 - 0.09	B916S
Benzo(k)fluoranthene	3 / 4	75%	0.02 - 0.06	B916S
Chrysene	3 / 4	75%	0.03 - 0.13	B916S
Dibenz(a,h)anthracene	1 / 4	25%	0.02	B916S
Fluoranthene	3 / 4	75%	0.06 - 0.29	B916S
Indeno(1,2,3-cd)pyrene	3 / 4	75%	0.02 - 0.07	B916S
Phenanthrene	2 / 4	50%	0.07 - 0.19	B916S
Pyrene	3 / 4	75%	0.04 - 0.21	B916S

Notes:
Includes 2001 data collected from 0-1 ft bgs in unpaved areas.
Includes only those chemicals that were detected in at least one sample.
mg/kg - milligrams per kilogram
ft - feet
bgs - below ground surface

Table 7-8
Soil-Gas Data Summary
Building 430 Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Number of Detects/ Number of Samples	Percent Positive Detects	Range of Detected Concentrations	Location of Maximum Concentration
Volatiles (ug/L)				
Carbon tetrachloride	72 / 80	90%	0.12 - 15.7	B-915
Trichloroethene	12 / 80	15%	0.11 - 0.80	B-924

Notes:
Data set includes 2001 data collected from nine ft bgs (See Figure 7-1).
Includes only those chemicals that were detected in at least one sample.
ug/L - micrograms per Liter
ft - feet
bgs - below ground surface

Table 7-9
Groundwater Data Summary
Building 430 Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Number of Detects/ Number of Samples	Percent Positive Detects	Range of Detected Concentrations	Location of Maximum Concentration
Volatiles (ug/L)				
Chloroform	4 / 4	100%	0.9 - 1.8	B354-01-26

Notes:
Includes data collected from monitoring well B354-01-26 during sampling events from 10/00 through 7/02.
Includes only those chemicals that were detected in at least one sample and were not analyzed in soil gas.
ug/L - micrograms per Liter

Table 7-10
Groundwater Data Summary
Point Bar Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Number of Detects/ Number of Samples	Percent Positive Detects	Range of Detected Concentrations	Location of Maximum Concentration	Sample Date
Volatiles (ug/L)					
Benzene	1 / 128	0.7%	1.00	MW95-03	July 2002
Bromodichloromethane	1 / 128	0.7%	0.70	MW95-04	October 2001
Carbon tetrachloride	4 / 128	3.1%	0.80 - 1.6	GWPZ-D	March 2001
Chloroform	4 / 128	3.1%	0.50 - 1.0	MW95-04	March 2001
cis-1,2-Dichloroethene	59 / 128	46%	0.50 - 7.9	354-99-12B	October 2000
Dibromochloromethane	1 / 128	0.7%	0.90	MW95-04	October 2001
Tetrachloroethene	19 / 128	15%	1.2 - 9.7	GWPZ-D	March 2001
trans-1,2-Dichloroethene	3 / 128	2.3%	0.50	354-99-12B & 354-99-12C	March 2001 & October 2001
Trichloroethene	26 / 128	20%	0.60 - 1.9	354-99-12C	July 2002

Notes:
Includes data collected from the 22 point bar wells during sampling events from 10/00 through 7/02.
Includes only those chemicals that were detected in at least one sample.
ug/L - micrograms per Liter
MW - Monitoring Well

Table 7-11
Noncarcinogenic Toxicity Information for Chemicals of Potential Concern
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Oral RfD (mg/kg/day)	Source	Toxic Effect of Concern	Inhalation RfD[1] (mg/kg/day)	Source	Toxic Effect of Concern
PAHs						
Acenaphthylene						
Benzo(a)anthracene						
Benzo(a)pyrene						
Benzo(b)fluoranthene						
Benzo(g,h,i)perylene						
Benzo(k)fluoranthene						
Chrysene						
Dibenz(a,h)anthracene						
Fluoranthene	4E-02	IRIS	Nephropathy, increased liver weights, hematological alterations, and clinical effects			
Indeno(1,2,3-cd)pyrene						
Naphthalene	2E-02	IRIS	Decreased mean terminal body weight in males	9E-04	IRIS	Nasal effects: hyperplasia and metaplasia in olfactory and respiratory epithelium
Phenanthrene						
Pyrene	3E-02	IRIS	Renal tubular pathology, decreased kidney weights			
Volatiles						
1,1,2-Trichloroethane	4E-03	IRIS	Clinical serum chemistry			
Acetone	1E-01	IRIS	Increased liver/kidney weights, nephrotoxicity			
Benzene	4E-03	IRIS	Decreased lymphocyte count	9E-03	IRIS	Decreased lymphocyte count
Carbon disulfide	1E-01	IRIS	Fetal toxicity/malformations	2E-01	IRIS	Peripheral nervous system dysfunction
Carbon tetrachloride	7E-04	IRIS	Liver lesions	6E-04	STSC, a	Liver lesions
Chloroform	1E-02	IRIS	Moderate/marked fatty cyst formation in the liver			
cis-1,2-Dichloroethene	1E-02	HEAST	Decreased hematocrit/hemoglobin			
Ethylbenzene	1E-01	IRIS	Liver and kidney toxicity	3E-01	IRIS	Developmental toxicity
Tetrachloroethene	1E-02	IRIS	Hepatotoxicity in mice, weight gain in rats	2E-01	STSC	Renal tubular cell karyomegaly
Toluene	2E-01	IRIS	Changes in liver and kidney weights	1E-01	IRIS	Neurological effects and deneration of nasal epithelium
trans-1,2-Dichloroethene	2E-02	IRIS	Increased serum alkaline phosphates in male mice			
Trichloroethene	3E-04	STSC	Critical effects in the liver, kidney, and developing fetus	1E-02	STSC	Critical effects in the central nervous system, liver, and endocrine system
Xylenes, total	2E-01	IRIS	Decreased body weight, and increased mortality in males	3E-02	IRIS	Impaired motor coordination
Vinyl chloride	3E-03	IRIS	Liver cell polymorphism	3E-02	IRIS	Liver cell polymorphism

Table 7-11 (continued)
Noncarcinogenic Toxicity Information for Chemicals of Potential Concern
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Notes:

[1] - RfC (mg/m^3) values are converted to RfD (mg/kg/day) values using the equation provided in the preface of HEAST.
IRIS - Integrated Risk Information System (USEPA, 2003)
HEAST - Health Effects Assessment Summary Tables (USEPA, 1997a)
KDHE - Risk-Based Standards for Kansas (KDHE, 2001)
STSC - Superfund Technical Support Center (USEPA, 2002)
COPCs - Chemicals of Potential Concern
a - STSC provided a subchronic inhalation RfC for carbon tetrachloride, which was adjusted by a factor of 10 to derive a chronic RfC.
For dermal exposure, current guidance recommends that oral RfDs be adjusted to reflect gastrointestinal absorption efficiency only when the absorption efficiency is less than 50 percent (USEPA, 2001). Absorption efficiencies for the COPCs are greater than 50 percent; thus dermal RfDs represent unadjusted oral RfDs.
Blanks indicate that information is not available.
PAH - Polycyclic Aromatic Hydrocarbon
RfD - Reference Dose
RfC - Reference Concentration
mg - milligrams
kg - kilograms
m^3 - cubic meters
mg/kg/day - milligrams per kilogram per day
mg/m^3 - milligrams per cubic meter

Table 7-12
USEPA Carcinogen Classification*
354 Area Solvent Detections RI Report
Fort Riley, Kansas

CARCINOGEN CATEGORIES

A	Human carcinogen
B	Probable human carcinogen
C	Possible human carcinogen
D	Not classifiable
E	Evidence of noncarcinogenicity

WEIGHT-OF-EVIDENCE CLASSIFICATION MATRIX

	Animal Evidence				
Human Evidence	Sufficient	Limited	Inadequate	No Data	No Evidence
Sufficient	A	A	A	A	A
Limited	B1	B1	B1	B1	B1
Inadequate	B2	C	D	D	D
No Data	B2	C	D	D	E
No Evidence	B2	D	D	D	E

Notes: The B category is subdivided into B1 and B2, with the strength of any available human data being the deciding factor.
USEPA = United States Environmental Protection Agency

* FR, 1986

Table 7-13
Carcinogenic Toxicity Information
354 Area Solvent Detection RI Report
Fort Riley, Kansas

Parameter	Weight-of-Evidence Classification[1]	Oral Slope Factor 1/(mg/kg/day)	Source	Inhalation Slope Factor[2] 1/(mg/kg/day)	Source	Site of Tumor
PAHs						
Acenaphthylene	D					
Benzo(a)anthracene	B2	7.3E-01	PAH			
Benzo(a)pyrene	B2	7.3E+00	IRIS	3.1E+00	STSC	Portal-of-entry
Benzo(b)fluoranthene	B2	7.3E-01	PAH			
Benzo(g,h,i)perylene	D					
Benzo(k)fluoranthene	B2	7.3E-02	PAH			
Chrysene	B2	7.3E-03	PAH			
Dibenz(a,h)anthracene	B2	7.3E+00	PAH			
Fluoranthene	D					
Indeno(1,2,3-cd)pyrene	B2	7.3E-01	PAH			
Naphthalene	C					
Phenanthrene	D					
Pyrene	D					
Volatiles						
1,1,2-Trichloroethane	C	5.7E-02	IRIS	5.6E-02	IRIS	Liver
Acetone	D					
Benzene	A	5.5E-02	IRIS	2.7E-02	IRIS	Blood/bone marrow
Carbon disulfide						
Carbon tetrachloride	B2	1.3E-01	IRIS	5.3E-02	IRIS	Liver
Chloroform	B2	NAp		8.1E-02	IRIS	Liver
cis-1,2-Dichloroethene	D					
Ethylbenzene	D					
Tetrachloroethene		5.2E-02	STSC	1.1E-02	STSC	Liver
Toluene	D					
trans-1,2-Dichloroethene						
Trichloroethene		4.0E-01	STSC	4.0E-01	STSC	
Xylenes, total	D					
Vinyl chloride	A	7.5E-01	IRIS	1.5E-02	IRIS	Liver

Notes:

[1] - Weight of evidence classifications obtained from IRIS.

[2] - Unit risk [1/(mg/m^3)] values are converted to slope factors [1/(mg/kg/day)] values using the equation provided in the preface of HEAST.

IRIS - Integrated Risk Information System (USEPA, 2003)
STSC - Superfund Technical Support Center (USEPA, 2002)
HEAST - Health Effects Assessment Summary Tables (USEPA, 1997a)
PAH - Slope factor for benzo(a)pyrene adjusted as recommended in Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (USEPA, 1993).
NAp - Mechanistic data indicates that carcinogenicity of chloroform is an effect of noncancer cytotoxicity; thus, the noncancer RfD is considered protective of the cancer endpoint (USEPA, 2002).

For dermal exposure, current guidance recommends that oral slope factors be adjusted to reflect gastrointestinal absorption efficiency only when the absorption efficiency is less than 50 percent (USEPA, 2001). Absorption efficiencies for the COPCs are greater than 50 percent; thus, dermal slope factors represent unadjusted oral slope factors.

Blanks indicate that information is not available.
mg/m^3 - milligrams per cubic meter
mg/kg/day - milligrams per kilogram per day

Table 7-14
Summary of Pathways Considered for Human Health Risk Assessment
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Potentially Exposed Populations	Media-Specific Exposure Pathways	Pathway Selected for Risk Characterization	Reason for Selecting or Excluding Pathways
Building 367 Area			
Current Scenario			
Groundskeeper	Surface Soil	no	- Due to the presence of pavement, groundskeeping is not required in the Building 367 source area.
	Subsurface Soil	no	
	Groundwater	no	
	Soil Gas	no	
Future Scenario			
Groundskeeper	Surface Soil	no	- Due to the presence of pavement, groundskeeping is not required in the Building 367 source area.
	Subsurface Soil	no	
	Groundwater	no	
	Soil Gas	no	
Indoor Worker	Surface Soil	no	- Unpaved surface soil is not present.
	Subsurface Soil		
	Incidental ingestion	no	- Indoor workers are unlikely to directly contact subsurface soil.
	Dermal absorption	no	
	Inhalation of dust	no	
	Inhalation of vapors	yes	- Chemical vapors may migrate to indoor air.
	Groundwater		
	Ingestion	no	- Terrace groundwater is unlikely to be used as a potable water source.
	Dermal absorption	no	
	Inhalation of vapors	yes	- Chemical vapors may migrate to indoor air.
	Soil Gas	no	- Soil gas screening data is generally not considered of sufficient quality for use in risk assessment.
Utility Excavation Worker	Surface Soil	no	- Unpaved surface soil is not present.
	Subsurface Soil		
	Incidental ingestion	yes	- Presence of numerous utility lines on Main Post could necessitate repair, which may cause direct contact with shallow subsurface soil and inhalation of chemical vapors from soil.
	Dermal absorption	yes	
	Inhalation of dust	yes	
	Inhalation of vapors	yes	
	Groundwater		
	Ingestion	no	- Terrace groundwater is unlikely to be used as a potable water source and too deep for contact.
	Dermal absorption	no	
	Inhalation of vapors	yes	- Chemical vapors may migrate to ambient air.

Table 7-14 (continued)
Summary of Pathways Considered for Human Health Risk Assessment
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Potentially Exposed Populations	Media-Specific Exposure Pathways	Pathway Selected for Risk Characterization	Reason for Selecting or Excluding Pathways
Building 367 Area (continued)			
Future Scenario (continued)			
Utility Excavation Worker (continued)	Soil Gas	no	- Soil gas screening data is generally not considered of sufficient quality for use in risk assessment.
Building 354/332/DPW Compound Area			
Current Scenario			
Groundskeeper	Surface Soil		
	Incidental ingestion	yes	- Groundskeeping (mowing) could result in direct contact with surface soil in unpaved areas.
	Dermal absorption	yes	
	Inhalation of dust	yes	
	Inhalation of vapors	no	- No VOCs were detected in unpaved surface soil.
	Subsurface Soil		
	Incidental ingestion	no	- Groundskeepers are unlikely to directly contact subsurface soil.
	Dermal absorption	no	
	Inhalation of dust	no	
	Inhalation of vapors	yes	- Chemical vapors may migrate to ambient air.
	Groundwater		
	Ingestion	no	- Terrace groundwater is unlikely to be used as a potable water source.
	Dermal absorption	no	
	Inhalation of vapors	yes	- Chemical vapors may migrate to ambient air.
	Soil Gas	no	- Soil gas screening data is generally not considered of sufficient quality for use in risk assessment.
Indoor Worker	Surface Soil		
	Incidental ingestion	yes	- An indoor worker could incidentally ingest surface soil in the form of indoor dust.
	Dermal absorption	no	
	Inhalation of dust	no	
	Inhalation of vapors	no	- No VOCs were detected in unpaved surface soil.
	Subsurface Soil		
	Incidental ingestion	no	- Indoor workers are unlikely to directly contact subsurface soil.
	Dermal absorption	no	
	Inhalation of dust	no	
	Inhalation of vapors	yes	- Chemical vapors may migrate to indoor air.
	Groundwater		
	Ingestion	no	- Terrace groundwater is unlikely to be used as a potable water source.
	Dermal absorption	no	
	Inhalation of vapors	yes	- Chemical vapors may migrate to indoor air.

Table 7-14 (continued)
Summary of Pathways Considered for Human Health Risk Assessment
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Potentially Exposed Populations	Media-Specific Exposure Pathways	Pathway Selected for Risk Characterization	Reason for Selecting or Excluding Pathways
Building 354/332/DPW Compound Area (continued)			
Current Scenario (continued)			
Indoor Worker (continued)	Soil Gas	no	- Soil gas screening data is generally not considered of sufficient quality for use in risk assessment.
Future Scenario			
Groundskeeper	Surface Soil	no	- Due to the absence of ongoing sources of contamination, chemical concentrations are expected to remain similar and eventually decrease over time. Therefore, separate evaluation of future groundskeepers is unnecessary.
	Subsurface Soil	no	
	Groundwater	no	
	Soil Gas	no	
Indoor Worker	Surface Soil	no	- Due to the absence of ongoing sources of contamination, chemical concentrations are expected to remain similar and eventually decrease over time. Therefore, separate evaluation of future indoor workers is unnecessary.
	Subsurface Soil	no	
	Groundwater	no	
	Soil Gas	no	
Utility Excavation Worker	Surface Soil	no	- Although subsurface utilities are present in this area, the COPCs are similar to those in the Building 367 Area and are present at lower concentrations, thus resulting in a lower level of exposure and risk.
	Subsurface Soil	no	
	Groundwater	no	
	Soil Gas	no	
Building 430 Area			
Current Scenario			
Groundskeeper	Surface Soil	no	- Although groundskeepers are likely present in the Building 430 Area, the same COPCs are present in this area at lower concentrations than in other areas, thus resulting in a lower level of of exposure and risk. Therefore, separate evaluation of groundskeepers is duplicative and unnecessary.
	Subsurface Soil	no	
	Groundwater	no	
	Soil Gas	no	

Table 7-14 (continued)
Summary of Pathways Considered for Human Health Risk Assessment
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Potentially Exposed Populations	Media-Specific Exposure Pathways	Pathway Selected for Risk Characterization	Reason for Selecting or Excluding Pathways
Building 430 Area (continued)			
Current Scenario (continued)			
Indoor Worker	Surface Soil	no	- Although indoor workers are present in Building 430, the same COPCs are present in this area at lower concentrations than in other areas, thus resulting in a lower level of exposure and risk. Therefore, separate evaluation of indoor workers is duplicative and unnecessary.
	Subsurface Soil	no	
	Groundwater	no	
	Soil Gas	no	
Child Resident	Surface Soil		
	Incidental ingestion	yes	- Unpaved soil is present near the family housing units, thus children may come in direct contact with surface soil.
	Dermal absorption	yes	
	Inhalation of dust	yes	
	Inhalation of vapors	no	- VOCs were not detected in surface soil.
	Subsurface Soil		
	Incidental ingestion	no	- Children are unlikely to directly contact subsurface soil.
	Dermal absorption	no	
	Inhalation of dust	no	
	Inhalation of vapors	no	- VOCs were not detected in surface soil.
	Groundwater		
	Ingestion	no	- Terrace groundwater is unlikely to be used as a potable water source.
	Dermal absorption	no	
	Inhalation of vapors	yes	- Chemical vapors may migrate to ambient air.
	Soil Gas		
	Inhalation of vapors	yes	- Although soil gas data is not typically used in risk assessment, data from shallow soil-gas samples are likely to more accurately represent potential impacts to nearby buildings than data from groundwater at a depth of 58 feet below ground surface.
Adult Resident	Surface Soil	no	- Although adult residents are expected to be present in the Building 430 Area and are likely to experience the same potentially completed exposure pathways as children, children are the more sensitive population. Therefore, separate evaluation of adults was not necessary.
	Subsurface Soil	no	
	Groundwater	no	
	Soil Gas	no	

Table 7-14 (continued)
Summary of Pathways Considered for Human Health Risk Assessment
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Potentially Exposed Populations	Media-Specific Exposure Pathways	Pathway Selected for Risk Characterization	Reason for Selecting or Excluding Pathways
Building 430 Area (continued)			
Future Scenario			
Groundskeeper	Surface Soil	no	- Due to the absence of ongoing sources of contamination, chemical concentrations are expected to remain similar and eventually decrease over time. Therefore, separate evaluation of future groundskeepers is unnecessary.
	Subsurface Soil	no	
	Groundwater	no	
	Soil Gas	no	
Indoor Worker	Surface Soil	no	- Due to the absence of ongoing sources of contamination, chemical concentrations are expected to remain similar and eventually decrease over time. Therefore, separate evaluation of future indoor workers is unnecessary.
	Subsurface Soil	no	
	Groundwater	no	
	Soil Gas	no	
Utility Excavation Worker	Surface Soil	no	- Although subsurface utilities are present in this area, the COPCs are similar to those in the Building 367 Area and are present at lower concentrations.
	Subsurface Soil	no	
	Groundwater	no	
	Soil Gas	no	
Child Resident	Surface Soil	no	- Due to the absence of ongoing sources of contamination, chemical concentrations are expected to remain similar and eventually decrease over time. Therefore, separate evaluation of future child residents is unnecessary.
	Subsurface Soil	no	
	Groundwater	no	
	Soil Gas	no	
Adult Resident	Surface Soil	no	- Due to the absence of ongoing sources of contamination, chemical concentrations are expected to remain similar and eventually decrease over time. Therefore, separate evaluation of future adult residents is unnecessary.
	Subsurface Soil	no	
	Groundwater	no	
	Soil Gas	no	

Notes:
VOC - Volatile Organic Compound
COPC - Chemicals of Potential Concern
DPW - Directorate of Public Works

Table 7-15
Formula for Incidental Ingestion of Chemicals in Soil*
354 Area Solvent Detection RI Report
Fort Riley, Kansas

Equation:
IN = CS x IR x CF x FI x EF x ED / (BW x AT)

Where:
IN = Intake (milligram per kilogram per day [mg/kg/day])
CS = Chemical concentration in soil (milligram per kilogram [mg/kg])
IR = Ingestion rate (milligram of soil per day [mg-soil/day])
CF = Conversion factor (10^{-6} kilogram per milligram [kg/mg])
FI = Fraction ingested from contaminated source (unitless)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Body weight (kilogram [kg])
AT = Averaging time (days)

Utility Excavation Worker Variable Values:
CS = (See Table 7-2)
IR = 330 mg/day (USEPA, 2002a)
FI = 1.0 (Assumed worst case value)
EF = 6 days/year (See text)
ED = 25 years (USEPA, 1991)
BW = 70 kg (USEPA, 1989)
AT = 9,125 days for noncancer effects [25 years (ED) x 365 days/year] (USEPA, 1989)
25,550 days for cancer effects [70 years (Lifetime) x 365 days/year] (USEPA, 1989)

Groundskeeper Variable Values:
CS = (See Table 7-4)
IR = 100 mg/day (USEPA, 2002a)
FI = 1.0 (Assumed worst case value)
EF = 26 days/year (See text)
ED = 25 years (USEPA, 1991)
BW = 70 kg (USEPA, 1989)
AT = 9,125 days for noncancer effects [25 years (ED) x 365 days/year] (USEPA, 1989)
25,550 days for cancer effects [70 years (Lifetime) x 365 days/year] (USEPA, 1989)

Child Resident Variable Values:
CS = (See Table 7-7)
IR = 200 mg/day (USEPA, 1997)
FI = 1.0 (Assumed worst case value)
EF = 350 days/year (USEPA, 1991)
ED = 3 years (See text)
BW = 15 kg (USEPA, 1989)
AT = 1,095 days for noncancer effects [3 years (ED) x 365 days/year] (USEPA, 1989)
25,550 days for cancer effects [70 years (Lifetime) x 365 days/year] (USEPA, 1989)

Table 7-15 (continued)
Formula for Incidental Ingestion of Chemicals in Soil*
354 Area Solvent Detection RI Report
Fort Riley, Kansas

Indoor Worker Variable Values:

CS = (See Table 7-4)
IR = 50 mg/day (USEPA, 2002a)
FI = 1.0 (Assumed worst case value)
EF = 250 days/year (USEPA, 1991)
ED = 25 years (USEPA, 1991)
BW = 70 kg (USEPA, 1989)
AT = 1,095 days for noncancer effects [3 years (ED) x 365 days/year] (USEPA, 1989)
25,550 days for cancer effects [70 years (Lifetime) x 365 days/year] (USEPA, 1989)

*USEPA, 1989

Table 7-16
Formula for Dermal Absorption of Chemicals in Soil[*]
354 Area Solvent Detection RI Report
Fort Riley, Kansas

Equation:
AD = CS x CF x SA x AF x ABS x EF x ED / (BW x AT)

Where:
AD = Absorbed dose (milligram per kilogram per day [mg/kg/day])
CS = Chemical concentration in soil (milligram per kilogram [mg/kg])
CF = Conversion factor (10^{-6} kilogram per milligram [kg/mg])
SA = Skin surface area available for contact (squared centimeters per day [cm^2/day])
AF = Soil to skin adherence factor (milligram per squared centimeter [mg/cm^2])
ABS = Absorption factor (unitless)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Body weight (kilogram [kg])
AT = Averaging time (days)

Utility Excavation Worker Variable Values:
CS = (See Table 7-2)
SA = 3,600 cm^2 (mean surface areas of hands, forearms, and head) (USEPA, 1997)
AF = 0.20 mg/cm^2 (USEPA, 2001)
ABS = 0.13 for Polycyclic Aromatic Hydrocarbons (Based on benzo(a)pyrene) (USEPA, 2001)
0 for Volatiles (USEPA, 2001)
EF = 6 days/year (See text)
ED = 25 years (USEPA, 1991)
BW = 70 kg (USEPA, 1989)
AT = 9,125 days for noncancer effects [25 years (ED) x 365 days/year] (USEPA, 1989)
25,550 days for cancer effects [70 years (Lifetime) x 365 days/year] (USEPA, 1989)

Groundskeeper Variable Values:
CS = (See Table 7-4)
SA = 3,600 cm^2 (mean surface areas of hands, forearms, and head) (USEPA, 1997)
AF = 0.02 mg/cm^2 (USEPA, 2001)
ABS = 0.13 for Polycyclic Aromatic Hydrocarbons (Based on benzo(a)pyrene) (USEPA, 2001)
0 for Volatiles (USEPA, 2001)
EF = 26 days/year (See text)
ED = 25 years (USEPA, 1991)
BW = 70 kg (USEPA, 1989)
AT = 9,125 days for noncancer effects [25 years (ED) x 365 days/year] (USEPA, 1989)
25,550 days for cancer effects [70 years (Lifetime) x 365 days/year] (USEPA, 1989)

Child Resident Variable Values:
CS = (See Table 7-7)
SA = 2,800 cm^2 (mean surface areas of head, hands, forearms, lower legs, and feet) (USEPA, 2001)
AF = 0.2 mg/cm^2 (USEPA, 2001)
ABS = 0.13 for Polycyclic Aromatic Hydrocarbons (Based on benzo(a)pyrene) (USEPA, 2001)
0 for Volatiles (USEPA, 2001)
EF = 350 days/year (USEPA, 1991)
ED = 3 years (See text)
BW = 15 kg (USEPA, 1989)
AT = 1,095 days for noncancer effects [3 years (ED) x 365 days/year] (USEPA, 1989)
25,550 days for cancer effects [70 years (Lifetime) x 365 days/year] (USEPA, 1989)

[*] USEPA, 1989

Table 7-17
Formula for Inhalation of Chemicals in Fugitive Dust*
354 Area Solvent Detection RI Report
Fort Riley, Kansas

Equation:
IN = CS x IR x ET x EF x ED / (PEF x BW x AT)

Where:
IN = Intake (milligram per kilogram per day [mg/kg/day])
CS = Chemical concentration in soil (milligram per kilogram [mg/kg])
IR = Inhalation rate (cubic meters [m^3/hr])
ET = Exposure time (hours/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
PEF = Particulate emission factor (cubic meters per kilogram [m^3/kg])
BW = Body weight (kilogram [kg])
AT = Averaging time (days)

Utility Excavation Worker Variable Values:
CS = (See Table 7-2)
IR = 2.5 m^3/hr (mean value for outdoor worker - heavy activity) (USEPA, 1997)
ET = 8 hrs/day (Standard working day)
EF = 6 days/year (See text)
ED = 25 years (See text)
PEF = 1.18E+09 m^3/kg (KDHE, 2001)
BW = 70 kg (USEPA, 1989)
AT = 9,125 days for noncancer effects [25 years (ED) x 365 days/year] (USEPA, 1989)
25,550 days for cancer effects [70 years (Lifetime) x 365 days/year] (USEPA, 1989)

Groundskeeper Variable Values:
CS = (See Table 7-4)
IR = 1.5 m^3/hr (mean value for outdoor workers - moderate activity) (USEPA, 1997)
ET = 4 hrs/day (See text)
EF = 26 days/year (See text)
ED = 25 years (USEPA, 1991)
PEF = 1.18E+09 m^3/kg (KDHE, 2001)
BW = 70 kg (USEPA, 1989)
AT = 9,125 days for noncancer effects [25 years (ED) x 365 days/year] (USEPA, 1989)
25,550 days for cancer effects [70 years (Lifetime) x 365 days/year] (USEPA, 1989)

Child Resident Variable Values:
CS = (See Table 7-7)
IR = 0.272 m^3/hr (mean value for children ages 0-6 years) (USEPA, 1997)
ET = 24 hrs/day (Assumed worst case scenario)
EF = 350 days/year (USEPA, 1991)
ED = 3 years (See text)
PEF = 1.18E+09 m^3/kg (KDHE, 2001)
BW = 15 kg (USEPA, 1989)
AT = 1,095 days for noncancer effects [3 years (ED) x 365 days/year] (USEPA, 1989)
25,550 days for cancer effects [70 years (Lifetime) x 365 days/year] (USEPA, 1989)

* USEPA, 1989

Table 7-18
Formula for Inhalation of Vapor Phase Chemicals*
354 Area Solvent Detection RI Report
Fort Riley, Kansas

Equation:
IN = CA x IR x ET x EF x ED / (BW x AT)

Where:
IN = Intake (milligram per kilogram per day [mg/kg/day])
CA = Chemical concentrations in air (milligram per cubic meter [mg/m^3])
IR = Inhalation rate (cubic meter per hour [m^3/hr])
ET = Exposure time (hours/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Body weight (kilogram [kg])
AT = Averaging time (days)

Indoor Worker Variable Values:
CA = (See Tables 7-27 and 7-28)
IR = 0.633 m^3/hr (mean value for adults) (USEPA, 1997)
ET = 8 hours/day (Standard working day)
EF = 250 days/year (USEPA, 1991)
ED = 25 years (USEPA, 1991)
BW = 70 kg (USEPA, 1989)
AT = 9,125 days for noncancer effects [25 years (ED) x 365 days/year] (USEPA, 1989)
25,550 days for cancer effects [70 years (Lifetime) x 365 days/year] (USEPA, 1989)

Utility Excavation Worker Variable Values:
CA = (See Table 7-30)
IR = 2.5 m^3/hr (mean value for outdoor worker - heavy activity) (USEPA, 1997)
ET = 8 hours/day (Standard working day)
EF = 6 days/year (See text)
ED = 25 years (USEPA, 1991)
BW = 70 kg (USEPA, 1989)
AT = 9,125 days for noncancer effects [25 years (ED) x 365 days/year] (USEPA, 1989)
25,550 days for cancer effects [70 years (Lifetime) x 365 days/year] (USEPA, 1989)

Groundskeeper Variable Values:
CA = (See Table 7-29)
IR = 1.5 m^3/hr (mean value for outdoor workers - moderate activity) (USEPA, 1997)
ET = 4 hours/day (See text)
EF = 26 days/year (See text)
ED = 25 years (USEPA, 1991)
BW = 70 kg (USEPA, 1989)
AT = 9,125 days for noncancer effects [25 years (ED) x 365 days/year] (USEPA, 1989)
25,550 days for cancer effects [70 years (Lifetime) x 365 days/year] (USEPA, 1989)

Child Resident Variable Values:
CA = Modeled from groundwater concentrations (see Table 7-31)
IR = 0.272 m^3/hr (mean value for children ages 0-6 years) (USEPA, 1997)
ET = 24 hours/day (Assumed worst case scenario)
EF = 350 days/year (USEPA, 1991)
ED = 3 years (See text)
BW = 15 kg (USEPA, 1989)
AT = 1,095 days for noncancer effects [3 years (ED) x 365 days/year] (USEPA, 1989)
25,550 days for cancer effects [70 years (Lifetime) x 365 days/year] (USEPA, 1989)

* USEPA, 1989

Table 7-19
Exposure Concentrations in Shallow Subsurface Soil
Building 367 Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Maximum Detected Concentration (mg/kg)	95 Percent Upper Confidence Limit (UCL) (mg/kg)	Exposure Concentration Used in HHBRA (mg/kg)
PAHs			
Acenaphthylene	2.00E-01	1.50E-01	1.50E-01
Benzo(a)anthracene	1.30E-01	2.57E-02	2.57E-02
Benzo(a)pyrene	1.20E-01	2.27E-02	2.27E-02
Benzo(b)fluoranthene	2.00E-01	3.36E-02	3.36E-02
Benzo(g,h,i)perylene	1.00E-01	2.32E-02	2.32E-02
Benzo(k)fluoranthene	6.00E-02	1.15E-02	1.15E-02
Chrysene	6.00E-01	3.72E-02	3.72E-02
Dibenz(a,h)anthracene	6.00E-02	9.17E-03	9.17E-03
Fluoranthene	2.70E-01	3.67E-02	3.67E-02
Indeno(1,2,3-cd)pyrene	8.00E-02	1.29E-02	1.29E-02
Naphthalene	1.00E-01	7.37E-02	7.37E-02
Phenanthrene	8.00E-01	1.02E-01	1.02E-01
Pyrene	2.40E-01	4.07E-02	4.07E-02
Volatiles			
Acetone	2.20E-01	8.86E-02	8.86E-02
Carbon disulfide	7.00E-03	4.07E-03	4.07E-03
cis-1,2-Dichloroethene	8.12E+00	7.63E-01	7.63E-01
Tetrachloroethene	2.90E+01	5.92E+00	5.92E+00
trans-1,2-Dichloroethene	5.80E-02	5.96E-03	5.96E-03
Trichloroethene	7.60E-01	9.63E-02	9.63E-02
m,p-Xylene	6.40E-03	4.01E-03	4.01E-03

Notes:

Concentration used in HHBRA represents the lower of the 95 percent UCL or maximum detected concentration (USEPA, 1992).

One-half of the detection limit was used as a proxy concentration for results that were non-detect.

The 95 percent UCLs were calculated assuming a lognormal distribution.

HHBRA - Human Health Baseline Risk Assessment

mg/kg - milligrams per kilogram

Table 7-20
Exposure Concentrations in Groundwater
Building 367 Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Maximum Detected Concentration (mg/L)	95 Percent Upper Confidence Limit (UCL) (mg/L)	Exposure Concentration Used in HHBRA (mg/L)
Volatiles			
1,1,2-Trichloroethane	7.00E-04	5.20E-04	5.20E-04
Carbon tetrachloride	3.80E-03	3.69E-03	3.69E-03
Chloroform	2.20E-03	2.27E-03	2.20E-03
cis-1,2-Dichloroethene	1.50E-01	1.50E-01	1.50E-01
Tetrachloroethene	1.64E+00	2.23E+00	1.64E+00
trans-1,2-Dichloroethene	1.60E-03	1.55E-03	1.55E-03
Trichloroethene	6.51E-02	6.27E-02	6.27E-02
Vinyl chloride	9.00E-04	6.80E-04	6.80E-04

Notes:

Concentration used in HHBRA represents the lower of the 95 percent UCL or maximum detected concentration (USEPA, 1992).

One-half of the detection limit was used as a proxy concentration for results that were non-detect.

The 95 percent UCLs were calculated assuming a lognormal distribution.

HHBRA - Human Health Baseline Risk Assessment

mg/L - milligrams per Liter

Table 7-21
Exposure Concentrations in Surface Soil
Building 354/332/DPW Compound Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Maximum Detected Concentration (mg/kg)	95 Percent Upper Confidence Limit (UCL) (mg/kg)	Exposure Concentration Used in HHBRA (mg/kg)
PAHs			
Benzo(a)anthracene	4.00E-01	1.57E+05	4.00E-01
Benzo(a)pyrene	2.00E-01	2.51E+03	2.00E-01
Benzo(b)fluoranthene	4.00E-01	1.98E+05	4.00E-01
Benzo(g,h,i)perylene	2.00E-01	1.27E+03	2.00E-01
Benzo(k)fluoranthene	2.00E-01	1.97E+04	2.00E-01
Chrysene	4.00E-01	1.57E+05	4.00E-01
Dibenz(a,h)anthracene	8.00E-02	1.97E+01	8.00E-02
Fluoranthene	9.40E-01	1.54E+06	9.40E-01
Indeno(1,2,3-cd)pyrene	2.00E-01	9.81E+02	2.00E-01
Phenanthrene	7.10E-01	1.50E+03	7.10E-01
Pyrene	7.70E-01	1.92E+05	7.70E-01

Notes:
Concentration used in HHBRA represents the lower of the 95 percent UCL or maximum detected concentration (USEPA, 1992).
One-half of the detection limit was used as a proxy concentration for results that were non-detect.
The 95 percent UCLs were calculated assuming a lognormal distribution.
HHBRA - Human Health Baseline Risk Assessment
mg/kg - milligrams per kilogram

Table 7-22
Exposure Concentrations in Deep Subsurface Soil
Building 354/332/DPW Compound Area

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Maximum Detected Concentration (mg/kg)	95 Percent Upper Confidence Limit (UCL) (mg/kg)	Exposure Concentration Used in HHBRA (mg/kg)
Volatiles			
Benzene	1.24E-01	2.39E+05	1.24E-01
Ethylbenzene	7.40E+00	8.68E+12	7.40E+00
Toluene	2.20E-01	1.52E+05	2.20E-01
Xylenes, total	3.90E+01	2.45E+17	3.90E+01

Notes:

Concentration used in HHBRA represents the lower of the 95 percent UCL or maximum detected concentration (USEPA, 1992).

Analytical data from 1995 reported total xylenes, but analytical data from 2001 reported m,p-xylenes and o-xylenes. To establish a consistent data set, the 2001 data for m,p- and o-xylenes were combined and evaluated as total xylenes.

One-half of the detection limit was used as a proxy concentration for results that were non-detect.

The 95 percent UCLs were calculated assuming a lognormal distribution.

HHBRA - Human Health Baseline Risk Assessment

mg/kg - milligrams per kilogram

Table 7-23
Exposure Concentrations in Groundwater
Building 354/332/DPW Compound Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Maximum Detected Concentration (mg/L)	95 Percent Upper Confidence Limit (UCL) (mg/L)	Exposure Concentration Used in HHBRA (mg/L)
Volatiles			
Benzene	4.03E-02	2.66E-01	4.03E-02
Carbon tetrachloride	2.40E-03	1.82E-03	1.82E-03
Chloroform	1.50E-03	1.28E-03	1.28E-03
cis-1,2-Dichloroethene	1.92E-02	4.88E-02	1.92E-02
Ethylbenzene	8.50E-03	3.67E-03	3.67E-03
Tetrachloroethene	9.52E-02	1.80E+00	9.52E-02
Toluene	2.70E-03	1.97E-03	1.97E-03
trans-1,2-Dichloroethene	1.70E-03	5.43E-04	5.43E-04
Trichloroethene	3.60E-03	3.65E-03	3.60E-03
m,p-Xylene	8.70E-03	8.01E-03	8.01E-03
o-Xylene	1.20E-03	6.03E-04	6.03E-04

Notes:
Concentration used in HHBRA represents the lower of the 95 percent UCL or maximum detected concentration (USEPA, 1992).
One-half of the detection limit was used as a proxy concentration for results that were non-detect.
The 95 percent UCLs were calculated assuming a lognormal distribution.
HHBRA - Human Health Baseline Risk Assessment
mg/L - milligrams per Liter

Table 7-24
Exposure Concentrations in Surface Soil
Building 430 Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Maximum Detected Concentration (mg/kg)	95 Percent Upper Confidence Limit (UCL) (mg/kg)	Exposure Concentration Used in HHBRA (mg/kg)
PAHs			
Benzo(a)anthracene	1.20E-01	2.24E+02	1.20E-01
Benzo(a)pyrene	1.00E-01	9.91E+01	1.00E-01
Benzo(b)fluoranthene	1.20E-01	3.62E+02	1.20E-01
Benzo(g,h,i)perylene	9.00E-02	6.69E+01	9.00E-02
Benzo(k)fluoranthene	6.00E-02	4.80E+00	6.00E-02
Chrysene	1.30E-01	3.29E+02	1.30E-01
Dibenz(a,h)anthracene	2.00E-02	8.20E-02	2.00E-02
Fluoranthene	2.90E-01	9.66E+02	2.90E-01
Indeno(1,2,3-cd)pyrene	7.00E-02	8.90E+00	7.00E-02
Phenanthrene	1.90E-01	2.80E+00	1.90E-01
Pyrene	2.10E-01	1.71E+02	2.10E-01

Notes:

Concentration used in HHBRA represents the lower of the 95 percent UCL or maximum detected concentration (USEPA, 1992).

One-half of the detection limit was used as a proxy concentration for results that were non-detect.

The 95 percent UCLs were calculated assuming a lognormal distribution.

HHBRA - Human Health Baseline Risk Assessment

mg/kg - milligrams per kilogram

PAHs - Polycyclic Aromatic Hydrocarbons

Table 7-25
Exposure Concentrations in Soil Gas
Building 430 Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Maximum Detected Concentration (mg/m^3)	95 Percent Upper Confidence Limit (UCL) (mg/m^3)	Concentration Used in HHBRA (mg/m^3)
Volatiles			
Carbon tetrachloride	1.57E+01	4.06E+00	4.06E+00
Trichloroethene	8.00E-01	1.05E+00	8.00E-01

Notes:

Concentration used in HHBRA represents the lower of the 95 percent UCL or maximum detected concentration (USEPA, 1992).

One-half of the detection limit was used as a proxy concentration for results that were non-detect.

The 95 percent UCLs were calculated assuming a lognormal distribution.

HHBRA - Human Health Baseline Risk Assessment

mg/m^3 - milligrams per cubic meter

Table 7-26
Exposure Concentrations in Groundwater
Building 430 Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Maximum Detected Concentration (mg/L)	95 Percent Upper Confidence Limit (UCL) (mg/L)	Exposure Concentration Used in HHBRA (mg/L)
Volatiles			
Chloroform	1.80E-03	2.29E-03	1.80E-03

Notes:

Concentration used in HHBRA represents the lower of the 95 percent UCL or maximum detected concentration (USEPA, 1992).

One-half of the detection limit was used as a proxy concentration for results that were non-detect.

The 95 percent UCLs were calculated assuming a lognormal distribution.

HHBRA - Human Health Baseline Risk Assessment

mg/L - milligrams per Liter

Table 7-27
Vapor Concentrations in Indoor Air
Building 367 Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

	Soil			Groundwater			Exposure Concentration Used in HHBRA (mg/m^3)
Parameter	Concentration in Soil (mg/kg)	VFsesp (kg/m^3)	Concentration in Air (mg/m^3)	Concentration in Groundwater (mg/L)	VFwesp (L/m^3)	Concentration in Air (mg/m^3)	
Volatiles							
1,1,2-Trichloroethane	---	---	---	5.00E-04	8.61E-06	4.31E-09	4.31E-09
Acetone	8.86E-02	8.80E-06	7.80E-07	---	---	---	7.80E-07
Carbon disulfide	4.10E-03	1.01E-03	4.14E-06	---	---	---	4.14E-06
Carbon tetrachloride	---	---	---	3.70E-03	2.81E-04	1.04E-06	1.04E-06
Chloroform	---	---	---	2.20E-03	4.53E-05	9.97E-08	9.97E-08
cis-1,2-Dichloroethene	7.63E-01	1.35E-04	1.03E-04	1.50E-01	3.58E-05	5.37E-06	1.03E-04
Tetrachloroethene	5.92E+00	1.09E-04	6.45E-04	1.64E+00	1.57E-04	2.57E-04	6.45E-04
trans-1,2-Dichloroethene	6.00E-03	2.74E-04	1.64E-06	1.60E-03	7.89E-05	1.26E-07	1.64E-06
Trichloroethene	9.63E-02	1.69E-04	1.63E-05	6.27E-02	9.64E-05	6.04E-06	1.63E-05
m,p-Xylene	4.00E-03	4.80E-05	1.92E-07	---	---	---	1.92E-07
Vinyl chloride	---	---	---	7.00E-04	3.38E-04	2.37E-07	2.37E-07

Notes:

Concentration used in HHBRA represents the higher of the estimated concentration in air from soil or groundwater.
--- Indicates chemical was not detected in the identified medium.
HHBRA - Human Health Baseline Risk Assessment
mg/kg - milligrams per kilogram
kg/m^3 - kilograms per cubic meter
mg/m^3 - milligrams per cubic meter
mg/L - milligrams per Liter
L/m^3 - Liters per cubic meter
VFsesp - Volatilization factor for subsurface soil to indoor air
Vfwesp - Volatilization factor for groundwater to enclosed-space vapors

Table 7-28
Vapor Concentrations in Excavation Air
Building 367 Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

	Soil			Groundwater			Exposure
Parameter	**Concentration in Soil (mg/kg)**	**VFout (m^3/kg)**	**Concentration in Air (mg/m^3)**	**Concentration in Groundwater (mg/L)**	**VFwamb (L/m^3)**	**Concentration in Air (mg/m^3)**	**Concentration Used in HHBRA (mg/m^3)**
Volatiles							
1,1,2-Trichloroethane	---	---	---	5.00E-04	3.13E-08	1.57E-11	1.57E-11
Acetone	8.86E-02	3.16E+04	2.80E-06	---	---	---	2.80E-06
Carbon disulfide	4.10E-03	3.06E+03	1.34E-06	---	---	---	1.34E-06
Carbon tetrachloride	---	---	---	3.70E-03	8.64E-07	3.20E-09	3.20E-09
Chloroform	---	---	---	2.20E-03	1.52E-07	3.34E-10	3.34E-10
cis-1,2-Dichloroethene	7.63E-01	8.38E+03	9.11E-05	1.50E-01	1.23E-07	1.85E-08	9.11E-05
Tetrachloroethene	5.92E+00	9.47E+03	6.25E-04	1.64E+00	4.89E-07	8.02E-07	6.25E-04
trans-1,2-Dichloroethene	6.00E-03	5.88E+03	1.02E-06	1.60E-03	2.58E-07	4.13E-10	1.02E-06
Trichloroethene	9.63E-02	7.56E+03	1.27E-05	6.27E-02	3.08E-07	1.93E-08	1.27E-05
m,p-Xylene	4.00E-03	1.43E+04	2.80E-07	---	---	---	2.80E-07
Vinyl chloride	---	---	---	7.00E-04	1.02E-06	7.14E-10	7.14E-10

Notes:
Concentration in air from groundwater was calculated by multiplying the chemical concentration by volatilization factors obtained from Appendix 7C.
Concentration in air from soil was calculated by dividing the chemical concentration by volatilization factors obtained from Appendix 7C.
Concentration used in HHBRA represents the higher of the estimated concentration in air from soil or groundwater.
--- Indicates chemical was not detected in identified medium.
HHBRA - Human Health Baseline Risk Assessment
mg/kg - milligrams per kilogram
m^3/kg - cubic meters per kilogram
mg/m^3 - milligrams per cubic meter
mg/L - milligrams per Liter
L/m^3 - Liters per cubic meter
VFout - Volatilization factor from soil to outdoor air
VFwamb - Volatilization factor from groundwater to outdoor air

Table 7-29
Vapor Concentrations in Indoor Air
Building 354/332/DPW Compound Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Soil			Groundwater			Exposure Concentration Used in HHBRA (mg/m^3)
	Concentration in Soil (mg/kg)	VFsesp (kg/m^3)	Concentration in Air (mg/m^3)	Concentration in Groundwater (mg/L)	VFwesp (L/m^3)	Concentration in Air (mg/m^3)	
Volatiles							
Benzene	1.24E-01	1.89E-04	2.34E-05	4.03E-02	5.98E-05	2.41E-06	2.34E-05
Carbon tetrachloride	---	---	---	1.82E-03	2.89E-04	5.26E-07	5.26E-07
Chloroform	---	---	---	1.30E-03	4.66E-05	6.06E-08	6.06E-08
cis-1,2-Dichloroethene	---	---	---	1.90E-02	3.68E-05	6.99E-07	6.99E-07
Ethylbenzene	7.40E+00	9.17E-05	6.79E-04	3.70E-03	7.21E-05	2.67E-07	6.79E-04
Tetrachloroethene	---	---	---	9.52E-02	1.61E-04	1.53E-05	1.53E-05
Toluene	2.20E-01	1.23E-04	2.71E-05	2.00E-03	7.05E-05	1.41E-07	2.71E-05
trans-1,2-Dichloroethene	---	---	---	5.13E-04	8.11E-05	4.16E-08	4.16E-08
Trichloroethene	---	---	---	3.60E-03	9.91E-05	3.57E-07	3.57E-07
m,p-Xylene	---	---	---	8.01E-03	6.74E-05	5.40E-07	Not evaluated
o-Xylene	---	---	---	6.03E-04	5.53E-05	3.33E-08	Not evaluated
Xylenes, total	3.90E+01	4.66E-05	1.82E-03	---	---	5.73E-07	1.82E-03

Notes:

Concentration used in HHBRA represents the higher of the estimated concentration in air from soil or groundwater.

Not evaluated - Analytical data from soil reported total xylenes, but analytical data from groundwater reported m,p-xylenes and o-xylenes. To establish a consistent data set, the calculated concentrations in air from groundwater for m,p- and o-xylenes were combined and evaluated as total xylenes.

--- Indicates chemical was not detected in the identified medium.

HHBRA - Human Health Baseline Risk Assessment

mg/kg - milligrams per kilogram

kg/m^3 - kilograms per cubic meter

mg/m^3 - milligrams per cubic meter

mg/L - milligrams per Liter

L/m^3 -Liters per cubic meter

VFsesp - Volatilization factor for subsurface soil to indoor air

Vfwesp - Volatilization factor for groundwater to enclosed-space vapors

Table 7-30
Vapor Concentrations in Outdoor Air
Building 354/332/DPW Compound Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Soil			Groundwater			Exposure Concentration Used in HHBRA (mg/m^3)
	Concentration in Soil (mg/kg)	VFout (m^3/kg)	Concentration in Air (mg/m^3)	Concentration in Groundwater (mg/L)	VFwamb (L/m^3)	Concentration in Air (mg/m^3)	
Volatiles							
Benzene	1.24E-01	5.91E+03	2.10E-05	4.03E-02	1.56E-05	6.29E-07	2.10E-05
Carbon tetrachloride	---	---	---	1.82E-03	6.66E-05	1.21E-07	1.21E-07
Chloroform	---	---	---	1.30E-03	1.25E-05	1.63E-08	1.63E-08
cis-1,2-Dichloroethene	---	---	---	1.90E-02	1.03E-05	1.96E-07	1.96E-07
Ethylbenzene	7.40E+00	8.49E+03	8.72E-04	3.70E-03	1.80E-05	6.66E-08	8.72E-04
Tetrachloroethene	---	---	---	9.52E-02	3.81E-05	3.63E-06	3.63E-06
Toluene	2.20E-01	7.34E+03	3.00E-05	2.00E-03	1.78E-05	3.56E-08	3.00E-05
trans-1,2-Dichloroethene	---	---	---	5.13E-04	2.09E-05	1.07E-08	1.07E-08
Trichloroethene	---	---	---	3.60E-03	2.44E-05	8.78E-08	8.78E-08
m,p-Xylene	---	---	---	8.01E-03	1.70E-05	1.36E-07	Not evaluated
o-Xylene	---	---	---	6.03E-04	1.46E-05	8.80E-09	Not evaluated
Xylenes, total	3.90E+01	9.79E+03	3.98E-03	---	---	1.45E-07	3.98E-03

Notes:

Concentration in air from groundwater was calculated by multiplying the chemical concentration by volatilization factors obtained from Appendix 7C.

Concentration in air from soil was calculated by dividing the chemical concentration by volatilization factors obtained from Appendix 7C.

Concentration used in HHBRA represents the higher of the estimated concentration in air from soil or groundwater.

Not evaluated - Analytical data from soil reported total xylenes, but analytical data from groundwater reported m,p-xylenes and o-xylenes. To establish a consistent data set, the calculated concentrations in air from groundwater for m,p- and o-xylenes were combined and evaluated as total xylenes.

--- Indicates chemical was not detected in the identified medium.

HHBRA - Human Health Baseline Risk Assessment

mg/kg - milligrams per kilogram

m^3/kg - cubic meters per kilogram

mg/m^3 - milligrams per cubic meter

mg/L - milligrams per Liter

L/m^3 - Liters per cubic meter

Table 7-31
Vapor Concentrations in Indoor Air
Building 430 Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Parameter	Soil Gas		Groundwater			Exposure Concentration Used in HHBRA (mg/m^3)
	Concentration in Soil Gas (mg/m^3)	Concentration in Air (mg/m^3)	Concentration in Groundwater (mg/L)	VFwesp (L/m^3)	Concentration in Air (mg/m^3)	
Volatiles						
Carbon tetrachloride	4.06E+00	5.71E-08	---	---	---	5.71E-08
Chloroform	---	---	1.80E-03	6.21E-06	1.12E-08	1.12E-08
Trichloroethene	8.00E-01	1.04E-08	---	---	---	1.04E-08

Notes:

Concentration in air from soil-gas was calculated as described on Table 7C- 22 in Appendix 7C.

Concentration in air from groundwater was calculated by multiplying the chemical concentration by volatilization factors obtained from Appendix 7C.

Concentrations in air from groundwater were only estimated for chemicals that were not analyzed in soil gas.

HHBRA - Human Health Baseline Risk Assessment

mg/m^3 - milligrams per cubic meter

mg/L - milligrams per Liter

L/m^3 - Liters per cubic meter

VFwesp - Volatilization factor for groundwater to enclosed-space vapors

Table 7-32
Hazard Index Estimates for Future Indoor Worker Scenario
Building 367 Area

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Daily Intake (mg/kg/day)	RfD (mg/kg/day)	Hazard Quotient	Pathway Hazard Index	Total Hazard Index
Exposure Pathway: Inhalation of chemical vapors					
Volatiles					
1,1,2-Trichlorethane	2.1E-10	NAv	NAp		
Acetone	3.9E-08	NAv	NAp		
Carbon disulfide	2.0E-07	2E-01	1E-06		
Carbon tetrachloride	5.1E-08	6E-04	9E-05		
Chloroform	4.9E-09	NAv	NAp		
cis-1,2-Dichloroethene	5.1E-06	NAv	NAp		
Tetrachloroethene	3.2E-05	2E-01	2E-04		
trans-1,2-Dichloroethene	8.2E-08	NAv	NAp		
Trichloroethene	8.1E-07	1E-02	8E-05		
m,p-Xylene	9.5E-09	3E-02	3E-07		
Vinyl chloride	1.2E-08	3E-02	4E-07		
				3E-04	
					3E-04

Notes:
NAv - Not available
NAp - Not applicable
mg/kg/day - milligrams per kilogram per day
RfD - Reference Dose

Table 7-33
Excess Lifetime Cancer Risk Estimate for Future Indoor Worker Scenario
Building 367 Area

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Daily Intake (mg/kg/day)	Slope Factor (mg/kg/day)-1	Excess Cancer Risk	Pathway Cancer Risk	Total Cancer Risk
Exposure Pathway: Inhalation of chemical vapors					
Volatiles					
1,1,2-Trichlorethane	7.6E-11	5.6E-02	4E-12		
Carbon tetrachloride	1.8E-08	5.3E-02	1E-09		
Chloroform	1.8E-09	8.1E-02	1E-10		
Tetrachloroethene	1.1E-05	1.1E-02	1E-07		
Trichloroethene	2.9E-07	4.0E-01	1E-07		
Vinyl chloride	4.2E-09	1.5E-02	6E-11		
				2E-07	
					2E-07

Note:
mg/kg/day - milligrams per kilogram per day

Table 7-34
Hazard Index Estimates for Future Utility Excavation Worker Scenario Building 367 Area

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Daily Intake (mg/kg/day)	RfD (mg/kg/day)	Hazard Quotient	Pathway Hazard Index	Total Hazard Index
Exposure Pathway: Incidental ingestion of chemicals in soil					
PAHs					
Acenaphthylene	1.2E-08	NAv	NAp		
Benzo(a)anthracene	2.0E-09	NAv	NAp		
Benzo(a)pyrene	1.8E-09	NAv	NAp		
Benzo(b)fluoranthene	2.6E-09	NAv	NAp		
Benzo(g,h,i)perylene	1.8E-09	NAv	NAp		
Benzo(k)fluoranthene	8.9E-10	NAv	NAp		
Chrysene	2.9E-09	NAv	NAp		
Dibenz(a,h)anthracene	7.1E-10	NAv	NAp		
Fluoranthene	2.8E-09	4E-02	7E-08		
Indeno(1,2,3-cd)pyrene	1.0E-09	NAv	NAp		
Naphthalene	5.7E-09	2E-02	3E-07		
Phenanthrene	7.9E-09	NAv	NAp		
Pyrene	3.2E-09	3E-02	1E-07		
Volatiles					
Acetone	6.9E-09	1E-01	7E-08		
Carbon disulfide	3.2E-10	1E-01	3E-09		
cis-1,2-Dichloroethene	5.9E-08	1E-02	6E-06		
Tetrachloroethene	4.6E-07	1E-02	5E-05		
trans-1,2-Dichloroethene	4.6E-10	2E-02	2E-08		
Trichloroethene	7.5E-09	3E-04	2E-05		
m,p-Xylene	3.1E-10	2E-01	2E-09		
				8E-05	
Exposure Pathway: Dermal contact with chemicals in soil					
PAHs					
Acenaphthylene	3.3E-09	NAv	NAp		
Benzo(a)anthracene	5.6E-10	NAv	NAp		
Benzo(a)pyrene	5.0E-10	NAv	NAp		
Benzo(b)fluoranthene	7.4E-10	NAv	NAp		
Benzo(g,h,i)perylene	5.1E-10	NAv	NAp		
Benzo(k)fluoranthene	2.5E-10	NAv	NAp		
Chrysene	8.2E-10	NAv	NAp		
Dibenz(a,h)anthracene	2.0E-10	NAv	NAp		
Fluoranthene	8.1E-10	4E-02	2E-08		
Indeno(1,2,3-cd)pyrene	2.8E-10	NAv	NAp		
Naphthalene	1.6E-09	2E-02	8E-08		
Phenanthrene	2.2E-09	NAv	NAp		
Pyrene	8.9E-10	3E-02	3E-08		
Volatiles					
Acetone	0.0E+00	1E-01	NAp		
Carbon disulfide	0.0E+00	1E-01	NAp		
cis-1,2-Dichloroethene	0.0E+00	1E-02	NAp		
Tetrachloroethene	0.0E+00	1E-02	NAp		
trans-1,2-Dichloroethene	0.0E+00	2E-02	NAp		
Trichloroethene	0.0E+00	3E-04	NAp		
m,p-Xylene	0.0E+00	2E-01	NAp		
				1E-07	

Table 7-34 (continued)
Hazard Index Estimates for
Future Utility Excavation Worker Scenario
Building 367 Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Daily Intake (mg/kg/day)	RfD (mg/kg/day)	Hazard Quotient	Pathway Hazard Index	Total Hazard Index
Exposure Pathway: Inhalation of chemicals in fugitive dust from soil					
PAHs					
Acenaphthylene	6.0E-13	NAv	NAp		
Benzo(a)anthracene	1.0E-13	NAv	NAp		
Benzo(a)pyrene	9.0E-14	NAv	NAp		
Benzo(b)fluoranthene	1.3E-13	NAv	NAp		
Benzo(g,h,i)perylene	9.2E-14	NAv	NAp		
Benzo(k)fluoranthene	4.6E-14	NAv	NAp		
Chrysene	1.5E-13	NAv	NAp		
Dibenz(a,h)anthracene	3.7E-14	NAv	NAp		
Fluoranthene	1.5E-13	NAv	NAp		
Indeno(1,2,3-cd)pyrene	5.1E-14	NAv	NAp		
Naphthalene	2.9E-13	9E-04	3E-10		
Phenanthrene	4.1E-13	NAv	NAp		
Pyrene	1.6E-13	NAv	NAp		
Volatiles					
Acetone	3.5E-13	NAv	NAp		
Carbon disulfide	1.6E-14	2E-01	8E-14		
cis-1,2-Dichloroethene	3.0E-12	NAv	NAp		
Tetrachloroethene	2.4E-11	2E-01	1E-10		
trans-1,2-Dichloroethene	2.4E-14	NAv	NAp		
Trichloroethene	3.8E-13	1E-02	4E-11		
m,p-Xylene	1.6E-14	3E-02	5E-13		
				5E-10	
Exposure Pathway: Inhalation of chemical vapors					
Volatiles					
1,1,2-Trichloroethane	7.4E-14	NAv	NAp		
Acetone	1.3E-08	NAv	NAp		
Carbon disulfide	6.3E-09	2E-01	3E-08		
Carbon tetrachloride	1.5E-11	6E-04	3E-08		
Chloroform	1.6E-12	0E+00	NAp		
cis-1,2-Dichloroethene	4.3E-07	NAv	NAp		
Tetrachloroethene	2.9E-06	2E-01	1E-05		
trans-1,2-Dichloroethene	4.8E-09	NAv	NAp		
Trichloroethene	6.0E-08	1E-02	6E-06		
m,p-Xylene	1.3E-09	3E-02	4E-08		
Vinyl chloride	3.3E-12	3E-02	1E-10		
				2E-05	
					1E-04

Notes:
NAv - Not available
NAp - Not applicable
PAH - Polycyclic Aromatic Hydrocarbons
mg/kg/day - milligrams per kilogram per day
RfD - Reference Dose

Table 7-35
Excess Lifetime Cancer Risk Estimate for Future Utility Excavation Worker Scenario
Building 367 Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Daily Intake (mg/kg/day)	Slope Factor (mg/kg/day)-¹	Excess Cancer Risk	Pathway Cancer Risk	Total Cancer Risk
Exposure Pathway: Incidental ingestion of chemicals in soil					
PAHs					
Benzo(a)anthracene	7.1E-10	7.3E-01	5E-10		
Benzo(a)pyrene	6.3E-10	7.3E+00	5E-09		
Benzo(b)fluoranthene	9.3E-10	7.3E-01	7E-10		
Benzo(k)fluoranthene	3.2E-10	7.3E-02	2E-11		
Chrysene	1.0E-09	7.3E-03	8E-12		
Dibenz(a,h)anthracene	2.5E-10	7.3E+00	2E-09		
Indeno(1,2,3-cd)pyrene	3.6E-10	7.3E-01	3E-10		
Naphthalene	2.0E-09	NAv	NAp		
Volatiles					
Tetrachloroethene	1.6E-07	5.2E-02	9E-09		
Trichloroethene	2.7E-09	4.0E-01	1E-09		
				2E-08	
Exposure Pathway: Dermal contact with chemicals in soil					
PAHs					
Benzo(a)anthracene	2.0E-10	7.3E-01	1E-10		
Benzo(a)pyrene	1.8E-10	7.3E+00	1E-09		
Benzo(b)fluoranthene	2.6E-10	7.3E-01	2E-10		
Benzo(k)fluoranthene	9.0E-11	7.3E-02	7E-12		
Chrysene	2.9E-10	7.3E-03	2E-12		
Dibenz(a,h)anthracene	7.2E-11	7.3E+00	5E-10		
Indeno(1,2,3-cd)pyrene	1.0E-10	7.3E-01	7E-11		
Naphthalene	5.8E-10	NAv	NAp		
Volatiles					
Tetrachloroethene	0.0E+00	5.2E-02	0E+00		
Trichloroethene	0.0E+00	4.0E-01	0E+00		
				2E-09	
Exposure Pathway: Inhalation of chemicals in fugitive dust from soil					
PAHs					
Benzo(a)anthracene	3.7E-14	NAv	NAp		
Benzo(a)pyrene	3.2E-14	3.1E+00	1E-13		
Benzo(b)fluoranthene	4.8E-14	NAv	NAp		
Benzo(k)fluoranthene	1.6E-14	NAv	NAp		
Chrysene	5.3E-14	NAv	NAp		
Dibenz(a,h)anthracene	1.3E-14	NAv	NAp		
Indeno(1,2,3-cd)pyrene	1.8E-14	NAv	NAp		
Naphthalene	1.0E-13	NAv	NAp		
Volatiles					
Tetrachloroethene	8.4E-12	1.1E-02	9E-14		
Trichloroethene	1.4E-13	4.0E-01	5E-14		
				2E-13	

Table 7-35 (continued)
Excess Lifetime Cancer Risk Estimate for Future Utility Excavation Worker Scenario
Building 367 Area

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Daily Intake (mg/kg/day)	Slope Factor $(mg/kg/day)^{-1}$	Excess Cancer Risk	Pathway Cancer Risk	Total Cancer Risk
Exposure Pathway: Inhalation of chemical vapors					
Volatiles					
1,1,2-Trichlorethane	2.6E-14	5.6E-02	1E-15		
Carbon tetrachloride	5.4E-12	5.3E-02	3E-13		
Chloroform	5.6E-13	8.1E-02	5E-14		
Tetrachloroethene	1.0E-06	1.1E-02	1E-08		
Trichloroethene	2.1E-08	4.0E-01	9E-09		
Vinyl chloride	1.2E-12	1.5E-02	2E-14		
				2E-08	
					4E-08

Notes:
NAv - Not available
NAp - Not applicable
PAH - Polycyclic Aromatic Hydrocarbons
mg/kg/day - milligrams per kilogram per day

Table 7-36
Hazard Index Estimates for Current Indoor Worker Scenario Building 354/332/DPW Compound Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Daily Intake (mg/kg/day)	RfD (mg/kg/day)	Hazard Quotient	Pathway Hazard Index	Total Hazard Index
Exposure Pathway: Incidental ingestion of chemicals in surface soil					
PAHs					
Benzo(a)anthracene	2.0E-07	NAv	NAp		
Benzo(a)pyrene	9.8E-08	NAv	NAp		
Benzo(b)fluoranthene	2.0E-07	NAv	NAp		
Benzo(g,h,i)perylene	9.8E-08	NAv	NAp		
Benzo(k)fluoranthene	9.8E-08	NAv	NAp		
Chrysene	2.0E-07	NAv	NAp		
Dibenz(a,h)anthracene	3.9E-08	NAv	NAp		
Fluoranthene	4.6E-07	4E-02	1E-05		
Indeno(1,2,3-cd)pyrene	9.8E-08	NAv	NAp		
Phenanthrene	3.5E-07	NAv	NAp		
Pyrene	3.8E-07	3E-02	1E-05		
				2E-05	
Exposure Pathway: Inhalation of chemical vapors					
Volatiles					
Benzene	1.2E-06	9E-03	1E-04		
Carbon tetrachloride	2.6E-08	6E-04	4E-05		
Chloroform	3.0E-09	NAv	NAp		
cis-1,2-Dichloroethene	3.5E-08	NAv	NAp		
Ethylbenzene	3.4E-05	3E-01	1E-04		
Tetrachloroethene	7.6E-07	2E-01	4E-06		
Toluene	1.3E-06	1E-01	1E-05		
trans-1,2-Dichloroethene	2.2E-09	NAv	NAp		
Trichloroethene	1.8E-08	1E-02	2E-06		
Xylenes, total	9.0E-05	3E-02	3E-03		
				3E-03	
					3E-03

Notes:
NAv - Not available
NAp - Not applicable
mg/kg/day - milligrams per kilogram per day
RfD - Reference Dose

Table 7-37
Excess Lifetime Cancer Risk Estimate for Current Indoor Worker Scenario
Building 354/332/DPW Compound Area

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Daily Intake (mg/kg/day)	Slope Factor (mg/kg/day)-1	Excess Cancer Risk	Pathway Cancer Risk	Total Cancer Risk
Exposure Pathway: Incidental ingestion of chemicals in surface soil					
PAHs					
Benzo(a)anthracene	7.0E-08	7.3E-01	5E-08		
Benzo(a)pyrene	3.5E-08	7.3E+00	3E-07		
Benzo(b)fluoranthene	7.0E-08	7.3E-01	5E-08		
Benzo(k)fluoranthene	3.5E-08	7.3E-02	3E-09		
Chrysene	7.0E-08	7.3E-03	5E-10		
Dibenz(a,h)anthracene	1.4E-08	7.3E+00	1E-07		
Indeno(1,2,3-cd)pyrene	3.5E-08	7.3E-01	3E-08		
				5E-07	
Exposure Pathway: Inhalation of chemical vapors					
Volatiles					
Benzene	4.1E-07	2.7E-02	1E-08		
Carbon tetrachloride	9.3E-09	5.3E-02	5E-10		
Chloroform	1.1E-09	8.1E-02	9E-11		
Ethylbenzene	1.2E-05	NAv	NAp		
Tetrachloroethene	2.7E-07	1.1E-02	3E-09		
Trichloroethene	6.3E-09	4.0E-01	3E-09		
				2E-08	
					5E-07

Notes:
NAv - Not available
NAp - Not applicable
mg/kg/day - milligrams per kilogram per day

Table 7-38
Hazard Index Estimates for
Current Groundskeeper Scenario
Building 354/332/DPW Compound Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Daily Intake (mg/kg/day)	RfD (mg/kg/day)	Hazard Quotient	Pathway Hazard Index	Total Hazard Index
Exposure Pathway: Incidental ingestion of chemicals in surface soil					
PAHs					
Benzo(a)anthracene	4.1E-08	NAv	NAp		
Benzo(a)pyrene	2.0E-08	NAv	NAp		
Benzo(b)fluoranthene	4.1E-08	NAv	NAp		
Benzo(g,h,i)perylene	2.0E-08	NAv	NAp		
Benzo(k)fluoranthene	2.0E-08	NAv	NAp		
Chrysene	4.1E-08	NAv	NAp		
Dibenz(a,h)anthracene	8.1E-09	NAv	NAp		
Fluoranthene	9.6E-08	4E-02	2E-06		
Indeno(1,2,3-cd)pyrene	2.0E-08	NAv	NAp		
Phenanthrene	7.2E-08	NAv	NAp		
Pyrene	7.8E-08	3E-02	3E-06		
				5E-06	
Exposure Pathway: Dermal contact with chemicals in surface soil					
PAHs					
Benzo(a)anthracene	3.8E-09	NAv	NAp		
Benzo(a)pyrene	1.9E-09	NAv	NAp		
Benzo(b)fluoranthene	3.8E-09	NAv	NAp		
Benzo(g,h,i)perylene	1.9E-09	NAv	NAp		
Benzo(k)fluoranthene	1.9E-09	NAv	NAp		
Chrysene	3.8E-09	NAv	NAp		
Dibenz(a,h)anthracene	7.6E-10	NAv	NAp		
Fluoranthene	9.0E-09	4E-02	2E-07		
Indeno(1,2,3-cd)pyrene	1.9E-09	NAv	NAp		
Phenanthrene	6.8E-09	NAv	NAp		
Pyrene	7.3E-09	3E-02	2E-07		
				5E-07	
Exposure Pathway: Inhalation of chemicals in fugitive dust from surface soil					
PAHs					
Benzo(a)anthracene	2.1E-12	NAv	NAp		
Benzo(a)pyrene	1.0E-12	NAv	NAp		
Benzo(b)fluoranthene	2.1E-12	NAv	NAp		
Benzo(g,h,i)perylene	1.0E-12	NAv	NAp		
Benzo(k)fluoranthene	1.0E-12	NAv	NAp		
Chrysene	2.1E-12	NAv	NAp		
Dibenz(a,h)anthracene	4.1E-13	NAv	NAp		
Fluoranthene	4.9E-12	NAv	NAp		
Indeno(1,2,3-cd)pyrene	1.0E-12	NAv	NAp		
Phenanthrene	3.7E-12	NAv	NAp		
Pyrene	4.0E-12	NAv	NAp		
				NAp	
Exposure Pathway: Inhalation of chemical vapors					
Volatiles					
Benzene	1.3E-07	9E-03	1E-05		
Carbon tetrachloride	7.4E-10	6E-04	1E-06		
Chloroform	9.8E-11	0E+00	NAp		
cis-1,2-Dichloroethene	1.2E-09	NAv	NAp		
Ethylbenzene	5.3E-06	3E-01	2E-05		
Tetrachloroethene	2.2E-08	2E-01	1E-07		

Table 7-38 (continued)
Hazard Index Estimates for Current Groundskeeper Scenario
Building 354/332/DPW Area

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Daily Intake (mg/kg/day)	RfD (mg/kg/day)	Hazard Quotient	Pathway Hazard Index	Total Hazard Index
Exposure Pathway: Inhalation of chemical vapors					
Volatiles (continued)					
Toluene	1.8E-07	1E-01	2E-06		
trans-1,2-Dichloroethene	6.9E-11	NAv	NAp		
Trichloroethene	5.4E-10	1E-02	5E-08		
Xylenes, total	2.4E-05	3E-02	8E-04		
				8E-04	
					9E-04

Notes:
NAv - Not available
NAp - Not applicable
PAH - Polycyclic Aromatic Hydrocarbons
RfD - Reference Dose
mg/kg/day - milligrams per kilogram per day

Table 7-39
Excess Lifetime Cancer Risk Estimate for Current Groundskeeper Scenario Building 354/332/DPW Compound Area
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Daily Intake (mg/kg/day)	Slope Factor (mg/kg/day)-1	Excess Cancer Risk	Pathway Cancer Risk	Total Cancer Risk
Exposure Pathway: Incidental ingestion of chemicals in surface soil					
PAHs					
Benzo(a)anthracene	1.5E-08	7.3E-01	1E-08		
Benzo(a)pyrene	7.3E-09	7.3E+00	5E-08		
Benzo(b)fluoranthene	1.5E-08	7.3E-01	1E-08		
Benzo(k)fluoranthene	7.3E-09	7.3E-02	5E-10		
Chrysene	1.5E-08	7.3E-03	1E-10		
Dibenz(a,h)anthracene	2.9E-09	7.3E+00	2E-08		
Indeno(1,2,3-cd)pyrene	7.3E-09	7.3E-01	5E-09		
				1E-07	
Exposure Pathway: Dermal contact with chemicals in surface soil					
PAHs					
Benzo(a)anthracene	1.4E-09	7.3E-01	1E-09		
Benzo(a)pyrene	6.8E-10	7.3E+00	5E-09		
Benzo(b)fluoranthene	1.4E-09	7.3E-01	1E-09		
Benzo(k)fluoranthene	6.8E-10	7.3E-02	5E-11		
Chrysene	1.4E-09	7.3E-03	1E-11		
Dibenz(a,h)anthracene	2.7E-10	7.3E+00	2E-09		
Indeno(1,2,3-cd)pyrene	6.8E-10	7.3E-01	5E-10		
				9E-09	
Exposure Pathway: Inhalation of chemicals in fugitive dust from surface soil					
PAHs					
Benzo(a)anthracene	7.4E-13	NAv	NAp		
Benzo(a)pyrene	3.7E-13	3.1E+00	1E-12		
Benzo(b)fluoranthene	7.4E-13	NAv	NAp		
Benzo(k)fluoranthene	3.7E-13	NAv	NAp		
Chrysene	7.4E-13	NAv	NAp		
Dibenz(a,h)anthracene	1.5E-13	NAv	NAp		
Indeno(1,2,3-cd)pyrene	3.7E-13	NAv	NAp		
				1E-12	
Exposure Pathway: Inhalation of vapors					
Volatiles					
Benzene	4.6E-08	2.7E-02	1E-09		
Carbon tetrachloride	2.6E-10	5.3E-02	1E-11		
Chloroform	3.5E-11	8.1E-02	3E-12		
Ethylbenzene	1.9E-06	0.0E+00	NAp		
Tetrachloroethene	7.9E-09	1.1E-02	9E-11		
Trichloroethene	1.9E-10	4.0E-01	8E-11		
				1E-09	
					1E-07

Notes:
NAv - Not available
NAp - Not applicable
PAH = Polycyclic Aromatic Hydrocarbon
mg/kg/day = milligrams per kilogram per day

Table 7-40
Hazard Index Estimates for Current Child Resident Scenario Building 430 Area

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Daily Intake (mg/kg/day)	RfD (mg/kg/day)	Hazard Quotient	Pathway Hazard Index	Total Hazard Index
Exposure Pathway: Incidental ingestion of chemicals in surface soil					
PAHs					
Benzo(a)anthracene	1.5E-06	NAv	NAp		
Benzo(a)pyrene	1.3E-06	NAv	NAp		
Benzo(b)fluoranthene	1.5E-06	NAv	NAp		
Benzo(g,h,i)perylene	1.2E-06	NAv	NAp		
Benzo(k)fluoranthene	7.7E-07	NAv	NAp		
Chrysene	1.7E-06	NAv	NAp		
Dibenz(a,h)anthracene	2.6E-07	NAv	NAp		
Fluoranthene	3.7E-06	4E-02	9E-05		
Indeno(1,2,3-cd)pyrene	8.9E-07	NAv	NAp		
Phenanthrene	2.4E-06	NAv	NAp		
Pyrene	2.7E-06	3E-02	9E-05		
				2E-04	
Exposure Pathway: Dermal contact with chemicals in surface soil					
PAHs					
Benzo(a)anthracene	5.6E-07	NAv	NAp		
Benzo(a)pyrene	4.7E-07	NAv	NAp		
Benzo(b)fluoranthene	5.6E-07	NAv	NAp		
Benzo(g,h,i)perylene	4.2E-07	NAv	NAp		
Benzo(k)fluoranthene	2.8E-07	NAv	NAp		
Chrysene	6.1E-07	NAv	NAp		
Dibenz(a,h)anthracene	9.3E-08	NAv	NAp		
Fluoranthene	1.3E-06	4E-02	3E-05		
Indeno(1,2,3-cd)pyrene	3.3E-07	NAv	NAp		
Phenanthrene	8.8E-07	NAv	NAp		
Pyrene	9.8E-07	3E-02	3E-05		
				7E-05	
Exposure Pathway: Inhalation of chemicals in fugitive dust from surface soil					
PAHs					
Benzo(a)anthracene	4.2E-11	NAv	NAp		
Benzo(a)pyrene	3.5E-11	NAv	NAp		
Benzo(b)fluoranthene	4.2E-11	NAv	NAp		
Benzo(g,h,i)perylene	3.2E-11	NAv	NAp		
Benzo(k)fluoranthene	2.1E-11	NAv	NAp		
Chrysene	4.6E-11	NAv	NAp		
Dibenz(a,h)anthracene	7.1E-12	NAv	NAp		
Fluoranthene	1.0E-10	NAv	NAp		
Indeno(1,2,3-cd)pyrene	2.5E-11	NAv	NAp		
Phenanthrene	6.7E-11	NAv	NAp		
Pyrene	7.4E-11	NAv	NAp		
				NAp	

Table 7-40 (continued)
Hazard Index Estimates for
Current Child Resident Scenario
Building 430 Area

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Daily Intake (mg/kg/day)	RfD (mg/kg/day)	Hazard Quotient	Pathway Hazard Index	Total Hazard Index
Exposure Pathway: Inhalation of chemical vapors					
Volatiles					
Carbon tetrachloride	2.4E-08	6E-04	4E-05		
Chloroform	4.7E-09	0E+00	NAp		
Trichloroethene	4.3E-09	1E-02	4E-07		
				4E-05	
					3E-04

Notes:
NAv - Not available
NAp - Not applicable
PAH - Polycyclic Aromatic Hydrocarbon
RfD - Reference Dose
mg/kg/day - milligrams per kilogram per day

Table 7-41
Excess Lifetime Cancer Risk Estimate for Current Child Resident Scenario
Building 430 Area

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Daily Intake (mg/kg/day)	Slope Factor (mg/kg/day)-1	Excess Cancer Risk	Pathway Cancer Risk	Total Cancer Risk
Exposure Pathway: Incidental ingestion of chemicals in surface soil					
PAHs					
Benzo(a)anthracene	6.6E-08	7.3E-01	4.8E-08		
Benzo(a)pyrene	5.5E-08	7.3E+00	4.0E-07		
Benzo(b)fluoranthene	6.6E-08	7.3E-01	4.8E-08		
Benzo(k)fluoranthene	3.3E-08	7.3E-02	2.4E-09		
Chrysene	7.1E-08	7.3E-03	5.2E-10		
Dibenz(a,h)anthracene	1.1E-08	7.3E+00	8.0E-08		
Indeno(1,2,3-cd)pyrene	3.8E-08	7.3E-01	2.8E-08		
				6E-07	
Exposure Pathway: Dermal contact with chemicals in surface soil					
PAHs					
Benzo(a)anthracene	2.4E-08	7.3E-01	2E-08		
Benzo(a)pyrene	2.0E-08	7.3E+00	1E-07		
Benzo(b)fluoranthene	2.4E-08	7.3E-01	2E-08		
Benzo(k)fluoranthene	1.2E-08	7.3E-02	9E-10		
Chrysene	2.6E-08	7.3E-03	2E-10		
Dibenz(a,h)anthracene	4.0E-09	7.3E+00	3E-08		
Indeno(1,2,3-cd)pyrene	1.4E-08	7.3E-01	1E-08		
				2E-07	
Exposure Pathway: Inhalation of chemicals in fugitive dust from surface soil					
PAHs					
Benzo(a)anthracene	1.8E-12	NAv	NAp		
Benzo(a)pyrene	1.5E-12	3.1E+00	5E-12		
Benzo(b)fluoranthene	1.8E-12	NAv	NAp		
Benzo(k)fluoranthene	9.1E-13	NAv	NAp		
Chrysene	2.0E-12	NAv	NAp		
Dibenz(a,h)anthracene	3.0E-13	NAv	NAp		
Indeno(1,2,3-cd)pyrene	1.1E-12	NAv	NAp		
				5E-12	
Exposure Pathway: Inhalation of chemical vapors					
Volatiles					
Carbon tetrachloride	1.0E-09	5.3E-02	5E-11		
Chloroform	2.0E-10	8.1E-02	2E-11		
Trichloroethene	1.9E-10	4.0E-01	7E-11		
				1E-10	
					8E-07

Notes:
NAv - Not available
NAp - Not applicable
PAH - Polycyclic Aromatic Hydrocarbon
mg/kg/day - milligrams per kilogram per day

Table 7-42
Hazard Index Estimates for Future Utility Excavation Worker Scenario
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Daily Intake (mg/kg/day)	RfD (mg/kg/day)	Hazard Quotient	Pathway Hazard Index	Total Hazard Index
Exposure Pathway: Incidental ingestion of chemicals in soil					
Metals					
Arsenic	3.6E-07	3E-04	1E-03		
Barium	1.3E-05	7E-02	2E-04		
Cadmium	4.6E-08	5E-04	9E-05		
Chromium	1.2E-06	3E-03	4E-04		
Lead	4.0E-06	NAv	NAp		
				2E-03	
Exposure Pathway: Dermal contact with chemicals in soil					
Metals					
Arsenic	2.4E-08	3E-04	8E-05		
Barium	2.9E-08	7E-02	4E-07		
Cadmium	1.0E-10	5E-04	2E-07		
Chromium	2.6E-09	3E-03	9E-07		
Lead	8.6E-09	NAv	NAp		
				8E-05	
Exposure Pathway: Inhalation of chemicals in fugitive dust from soil					
Metals					
Arsenic	1.9E-11	NAv	NAp		
Barium	6.8E-10	1E-04	5E-06		
Cadmium	2.4E-12	NAv	NAp		
Chromium	6.1E-11	3E-05	2E-06		
Lead	2.0E-10	NAv	NAp		
				7E-06	
					2E-03

Notes:

NAv - Not available

NAp - Not applicable

mg/kg/day - milligrams per kilogram per day

RfD - Reference Dose

Table 7-43
Excess Lifetime Cancer Risk Estimate for Future Utility Excavation Worker Scenario

354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Daily Intake (mg/kg/day)	Slope Factor $(mg/kg/day)^{-1}$	Excess Cancer Risk	Pathway Cancer Risk	Total Cancer Risk
Exposure Pathway: Incidental ingestion of chemicals in soil					
Metals					
Arsenic	1.3E-07	1.5E+00	2E-07		
Cadmium	1.7E-08	NAv	NAp		
Chromium	4.2E-07	NAv	NAp		
Lead	1.4E-06	NAv	NAp		
				2E-07	
Exposure Pathway: Dermal contact with chemicals in soil					
Metals					
Arsenic	8.5E-08	1.5E+00	1E-07		
Cadmium	3.6E-11	NAv	NAp		
Chromium	9.2E-10	NAv	NAp		
Lead	3.1E-09	NAv	NAp		
				1E-07	
Exposure Pathway: Inhalation of chemicals in fugitive dust from soil					
Metals					
Arsenic	6.7E-12	1.5E+01	1E-10		
Cadmium	8.5E-13	6.3E+00	5E-12		
Chromium	2.2E-11	4.2E+01	9E-10		
Lead	7.2E-11	NAv	NAp		
				1E-09	
					3E-07

Notes:
NAv - Not available
NAp - Not applicable
mg/kg/day - milligrams per kilogram per day

Table 7-44
Summary of Risk Results
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Population	Noncarcinogenic Hazard Quotients	Carcinogenic Risks
Building 367 Area		
Future Indoor Worker		
Inhalation of Vapors Pathway	3E-04	2E-07
Future Indoor Worker Total	**3E-04**	**2E-07**
Future Utility Excavation Worker		
Ingestion Pathway	8E-05	2E-08
Dermal Pathway	1E-07	2E-09
Inhalation of Dust Pathway	5E-10	2E-13
Inhalation of Vapors Pathway	2E-05	2E-08
Future Utility Excavation Worker Total	**1E-04**	**4E-08**
Building 354/332/DPW Compound Area		
Current Indoor Worker		
Ingestion Pathway	2E-05	5E-07
Inhalation of Vapors Pathway	3E-03	2E-08
Current Indoor Worker Total	**3E-03**	**5E-07**
Current Groundskeeper		
Ingestion Pathway	5E-06	1E-07
Dermal Pathway	5E-07	9E-09
Inhalation of Dust Pathway	NAp	1E-12
Inhalation of Vapors Pathway	8E-04	1E-09
Current Groundskeeper Total	**9E-04**	**1E-07**
Building 430 Area		
Current Child Resident		
Ingestion Pathway	2E-04	6E-07
Dermal Pathway	7E-05	2E-07
Inhalation of Dust Pathway	NAp	5E-12
Inhalation of Vapors Pathway	4E-05	1E-10
Current Child Resident Total	**3E-04**	**8E-07**

Note:
NAp - Not applicable

Table 8-1
Formula for Calculating Preliminary Ingestion Dose in Soil
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Representative Wildlife Species	Average Body Weight (kg)	Food Ingestion Rate (kg/kg-day)	Percent of Soil in Diet	Estimated Consumption Rate of Soil in Diet (kg/day)[e]
Short-tailed Shrew	1.50E-02[a]	9.00E-03[a]	13.0[a]	1.17E-03
White-footed Mouse	2.20E-02[a]	3.40E-03[a]	2.0[a]	6.80E-05
Meadow Vole	4.40E-02[b]	5.00E-03[c]	2.4[d]	1.20E-04
Cottontail Rabbit	1.20E+00[b]	2.37E-01[c]	6.3[d]	1.49E-02
Red Fox	4.50E+00[a]	4.50E-01[a]	2.8[a]	1.26E-02
White-tailed Deer	5.65E+01[a]	1.74E+00[a]	2.0[a]	3.50E-02

Notes:

[a] – Based on reported body weight, food intake, and soil intake information from Efroymson et al. (1997)

[b] – Schwartz and Schwartz, 1981

[c] – Based on body weight and food intake information from ORNL (1996).

[d] – Estimated fraction of soil or sediment in diet as reported in USEPA, 1993a (The fraction of soil in diet for the jackrabbit was substituted for the cottontail rabbit).

[e] – Food Ingestion Rate x Percent of Soil in Diet (USEPA, 1993a)

Table 8-2
Preliminary Screening of Soil Analytical Data to Wildlife Benchmarks
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Maximum Concentration in Surface Soil[1] (mg/kg)	Representative Wildlife Species	No Observed Adverse Effects Level (NOAEL)[2] (mg/kg/day)	Weight Normalized NOAEL (mg/day)[3]	Consumption Rate of Soil (kg/day)[4]	Dose Received from Soil (mg/kg/day)[5]	Ecological Hazard Quotient	Chemical of Potential Ecological Concern[6]
PAHs								
Benzo(a)anthracene[7]	0.40	Short-tailed Shrew	1.19	1.79E-02	1.17E-03	4.68E-04	2.62E-02	No
		White-footed Mouse	1.08	2.38E-02	6.80E-05	2.72E-05	1.14E-03	
		Meadow Vole	0.91	4.00E-02	1.20E-04	4.80E-05	1.20E-03	
		Cottontail Rabbit	0.40	4.80E-01	1.49E-02	5.97E-03	1.24E-02	
		Red Fox	0.29	1.31E+00	1.26E-02	5.04E-03	3.86E-03	
		White-tailed Deer	0.15	8.48E+00	3.50E-02	1.40E-02	1.65E-03	
Benzo(a)pyrene	0.20	Short-tailed Shrew	1.19	1.79E-02	1.17E-03	2.34E-04	1.31E-02	No
		White-footed Mouse	1.08	2.38E-02	6.80E-05	1.36E-05	5.72E-04	
		Meadow Vole	0.91	4.00E-02	1.20E-04	2.40E-05	5.99E-04	
		Cottontail Rabbit	0.40	4.80E-01	1.49E-02	2.99E-03	6.22E-03	
		Red Fox	0.29	1.31E+00	1.26E-02	2.52E-03	1.93E-03	
		White-tailed Deer	0.15	8.48E+00	3.50E-02	7.00E-03	8.26E-04	
Benzo(b)fluoranthene[7]	0.40	Short-tailed Shrew	1.19	1.79E-02	1.17E-03	4.68E-04	2.62E-02	No
		White-footed Mouse	1.08	2.38E-02	6.80E-05	2.72E-05	1.14E-03	
		Meadow Vole	0.91	4.00E-02	1.20E-04	4.80E-05	1.20E-03	
		Cottontail Rabbit	0.40	4.80E-01	1.49E-02	5.97E-03	1.24E-02	
		Red Fox	0.29	1.31E+00	1.26E-02	5.04E-03	3.86E-03	
		White-tailed Deer	0.15	8.48E+00	3.50E-02	1.40E-02	1.65E-03	
Benzo(g,h,i)perylene[7]	0.20	Short-tailed Shrew	1.19	1.79E-02	1.17E-03	2.34E-04	1.31E-02	No
		White-footed Mouse	1.08	2.38E-02	6.80E-05	1.36E-05	5.72E-04	
		Meadow Vole	0.91	4.00E-02	1.20E-04	2.40E-05	5.99E-04	
		Cottontail Rabbit	0.40	4.80E-01	1.49E-02	2.99E-03	6.22E-03	
		Red Fox	0.29	1.31E+00	1.26E-02	2.52E-03	1.93E-03	
		White-tailed Deer	0.15	8.48E+00	3.50E-02	7.00E-03	8.26E-04	

Table 8-2 (continued)
Preliminary Screening of Soil Analytical Data to Wildlife Benchmarks
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Maximum Concentration in Surface Soil[1] (mg/kg)	Representative Wildlife Species	No Observed Adverse Effects Level (NOAEL)[2] (mg/kg/day)	Weight Normalized NOAEL (mg/day)[3]	Consumption Rate of Soil (kg/day)[4]	Dose Received from Soil (mg/kg/day)[5]	Ecological Hazard Quotient	Chemical of Potential Ecological Concern[6]
PAHs (continued)								
Benzo(k)fluoranthene[7]	0.20	Short-tailed Shrew	1.19	1.79E-02	1.17E-03	2.34E-04	1.31E-02	No
		White-footed Mouse	1.08	2.38E-02	6.80E-05	1.36E-05	5.56E-04	
		Meadow Vole	0.91	4.00E-02	1.20E-04	2.40E-05	5.80E-04	
		Cottontail Rabbit	0.40	4.80E-01	1.49E-02	2.99E-03	6.30E-03	
		Red Fox	0.29	1.31E+00	1.26E-02	2.52E-03	1.93E-03	
		White-tailed Deer	0.15	8.48E+00	3.50E-02	7.00E-03	8.00E-04	
Chrysene[7]	0.40	Short-tailed Shrew	1.19	1.79E-02	1.17E-03	4.68E-04	2.62E-02	No
		White-footed Mouse	1.08	2.38E-02	6.80E-05	2.72E-05	1.11E-03	
		Meadow Vole	0.91	4.00E-02	1.20E-04	4.80E-05	1.16E-03	
		Cottontail Rabbit	0.40	4.80E-01	1.49E-02	5.97E-03	1.26E-02	
		Red Fox	0.29	1.31E+00	1.26E-02	5.04E-03	3.86E-03	
		White-tailed Deer	0.15	8.48E+00	3.50E-02	1.40E-02	1.60E-03	
Dibenz(a,h)anthracene[7]	0.08	Short-tailed Shrew	1.19	1.79E-02	1.17E-03	9.36E-05	5.24E-03	No
		White-footed Mouse	1.08	2.38E-02	6.80E-05	5.44E-06	2.22E-04	
		Meadow Vole	0.91	4.00E-02	1.20E-04	9.60E-06	2.32E-04	
		Cottontail Rabbit	0.40	4.80E-01	1.49E-02	1.19E-03	2.52E-03	
		Red Fox	0.29	1.31E+00	1.26E-02	1.01E-03	7.72E-04	
		White-tailed Deer	0.15	8.48E+00	3.50E-02	2.80E-03	3.20E-04	
Fluoranthene[7]	0.94	Short-tailed Shrew	1.19	1.79E-02	1.17E-03	1.10E-03	6.16E-02	No
		White-footed Mouse	1.08	2.38E-02	6.80E-05	6.40E-05	2.61E-03	
		Meadow Vole	0.91	4.00E-02	1.20E-04	1.13E-04	2.73E-03	
		Cottontail Rabbit	0.40	4.80E-01	1.49E-02	1.40E-02	2.96E-02	
		Red Fox	0.29	1.31E+00	1.26E-02	1.18E-02	9.08E-03	
		White-tailed Deer	0.15	8.48E+00	3.50E-02	3.29E-02	3.76E-03	

Table 8-2 (continued)
Preliminary Screening of Soil Analytical Data to Wildlife Benchmarks
354 Area Solvent Detections RI Report
Fort Riley, Kansas

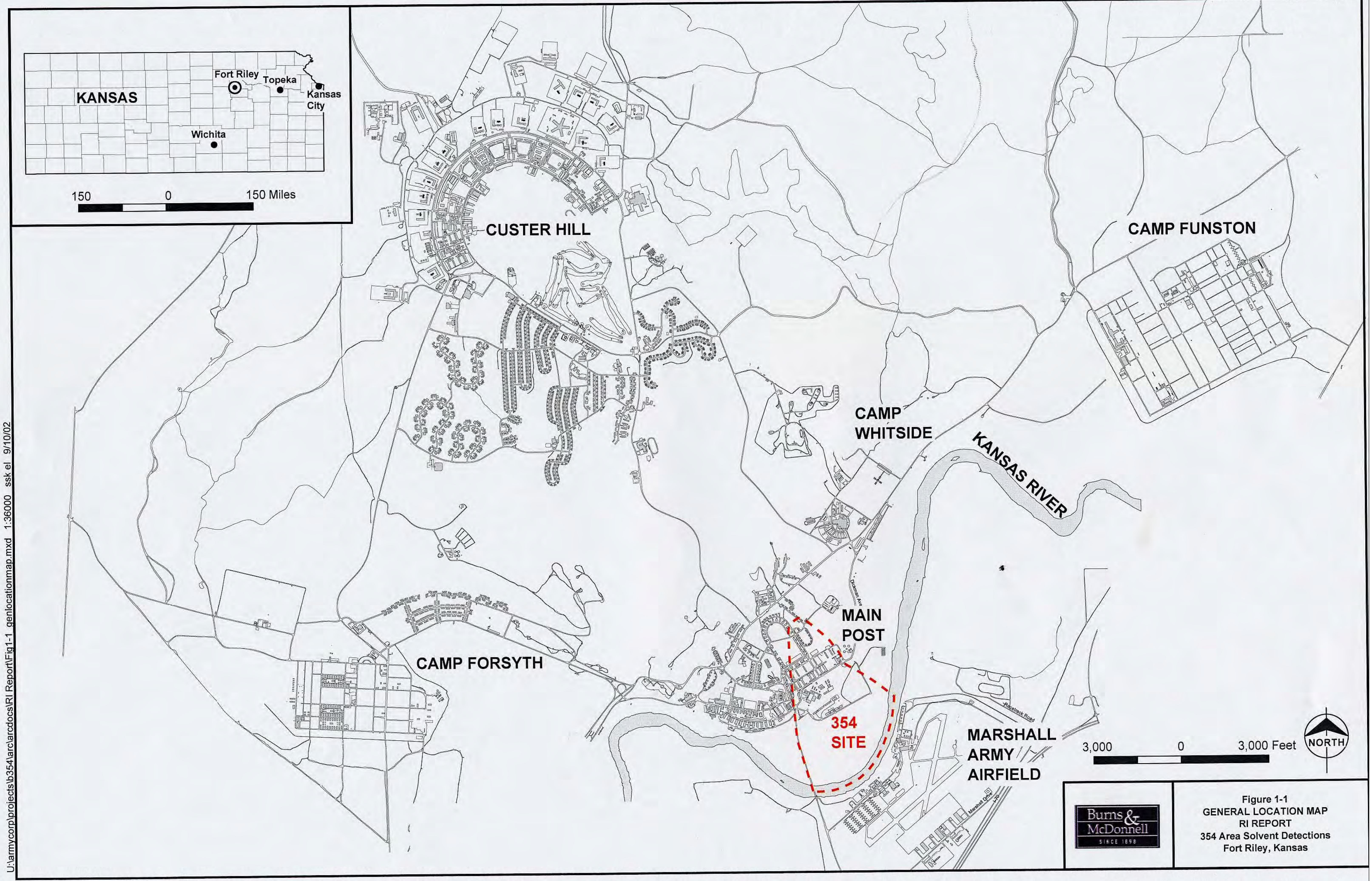
Chemical	Maximum Concentration in Surface Soil[1] (mg/kg)	Representative Wildlife Species	No Observed Adverse Effects Level (NOAEL)[2] (mg/kg/day)	Weight Normalized NOAEL (mg/day)[3]	Consumption Rate of Soil (kg/day)[4]	Dose Received from Soil (mg/kg/day)[5]	Ecological Hazard Quotient	Chemical of Potential Ecological Concern[6]
PAHs (continued)								
Indeno(1,2,3-cd)pyrene[7]	0.20	Short-tailed Shrew	1.19	1.79E-02	1.17E-03	2.34E-04	1.31E-02	No
		White-footed Mouse	1.08	2.38E-02	6.80E-05	1.36E-05	5.72E-04	
		Meadow Vole	0.91	4.00E-02	1.20E-04	2.40E-05	5.99E-04	
		Cottontail Rabbit	0.40	4.80E-01	1.49E-02	2.99E-03	6.22E-03	
		Red Fox	0.29	1.31E+00	1.26E-02	2.52E-03	1.93E-03	
		White-tailed Deer	0.15	8.48E+00	3.50E-02	7.00E-03	8.26E-04	
Phenanthrene[7]	0.71	Short-tailed Shrew	1.19	1.79E-02	1.17E-03	8.31E-04	4.65E-02	No
		White-footed Mouse	1.08	2.38E-02	6.80E-05	4.83E-05	2.03E-03	
		Meadow Vole	0.91	4.00E-02	1.20E-04	8.52E-05	2.13E-03	
		Cottontail Rabbit	0.40	4.80E-01	1.49E-02	1.06E-02	2.21E-02	
		Red Fox	0.29	1.31E+00	1.26E-02	8.95E-03	6.86E-03	
		White-tailed Deer	0.15	8.48E+00	3.50E-02	2.49E-02	2.93E-03	
Pyrene[7]	0.77	Short-tailed Shrew	1.19	1.79E-02	1.17E-03	9.01E-04	5.05E-02	No
		White-footed Mouse	1.08	2.38E-02	6.80E-05	5.24E-05	2.20E-03	
		Meadow Vole	0.91	4.00E-02	1.20E-04	9.24E-05	2.31E-03	
		Cottontail Rabbit	0.40	4.80E-01	1.49E-02	1.15E-02	2.40E-02	
		Red Fox	0.29	1.31E+00	1.26E-02	9.70E-03	7.43E-03	
		White-tailed Deer	0.15	8.48E+00	3.50E-02	2.70E-02	3.18E-03	

Notes:
[1] – Surface soil data set consists of soil samples collected in the vicinity of Building 430 and Building 354/332/DPW Areas, from 0-1 ft bgs in unpaved locations.
[2] – (ORNL 1996)
[3] – NOAEL x Average Body Weight
[4] – Food Ingestion Rate x Percent of Soil in Diet x Percent of Foraging Range within 354 Area (assumed to be 100%)
[5] – Estimated Value = Consumption Rate of Soil x Maximum Concentration Detected in Soil
[6] – A COPEC was determined by comparing Dose Received from Soil to the Weight-Normalized NOAEL.
[7] – Toxicity information was not available from the reference. Toxicity information for Benzo(a)pyrene was substituted for other PAHs.

Table 8-3
Comparison of Current Concentrations in Groundwater to Benthic Organism Benchmarks
354 Area Solvent Detections RI Report
Fort Riley, Kansas

Chemical	Maximum Concentration Detected in Groundwater[1] (ug/L)	Benchmark (ug/L)	Source	Ecological Hazard Quotient	Chemical of Potential Ecological Concern
Volatiles					
Benzene	1.0	130	USEPA Tier II Secondary Chronic Value	7.69E-03	No
Bromodichloromethane	0.7	NAv	--	--	
Carbon tetrachloride	1.6	240	USEPA Tier II Secondary Chronic Value	6.67E-03	No
Chloroform	1.0	28	USEPA Tier II Secondary Chronic Value	3.57E-02	No
cis-1,2-Dichloroethene	7.9	590	USEPA Tier II Secondary Chronic Value	1.34E-02	No
Dibromochloromethane	0.9	NAv	--	--	
Tetrachloroethene	9.7	840	KS Surface Water Quality Criteria[2]	1.15E-02	No
trans-1,2-Dichloroethene	0.5	590	USEPA Tier II Secondary Chronic Value	8.47E-04	No
Trichloroethene	1.9	21,900	KS Surface Water Quality Criteria[2]	8.68E-05	No
Vinyl chloride	0.8 U	NAv	--	--	

Notes:
[1] – Groundwater data set consists of samples collected from alluvial wells during sampling events from 10/00 through 7/02.
[2] – Chronic Value for Aquatic Life
U = Undetected
NAv = Not Available



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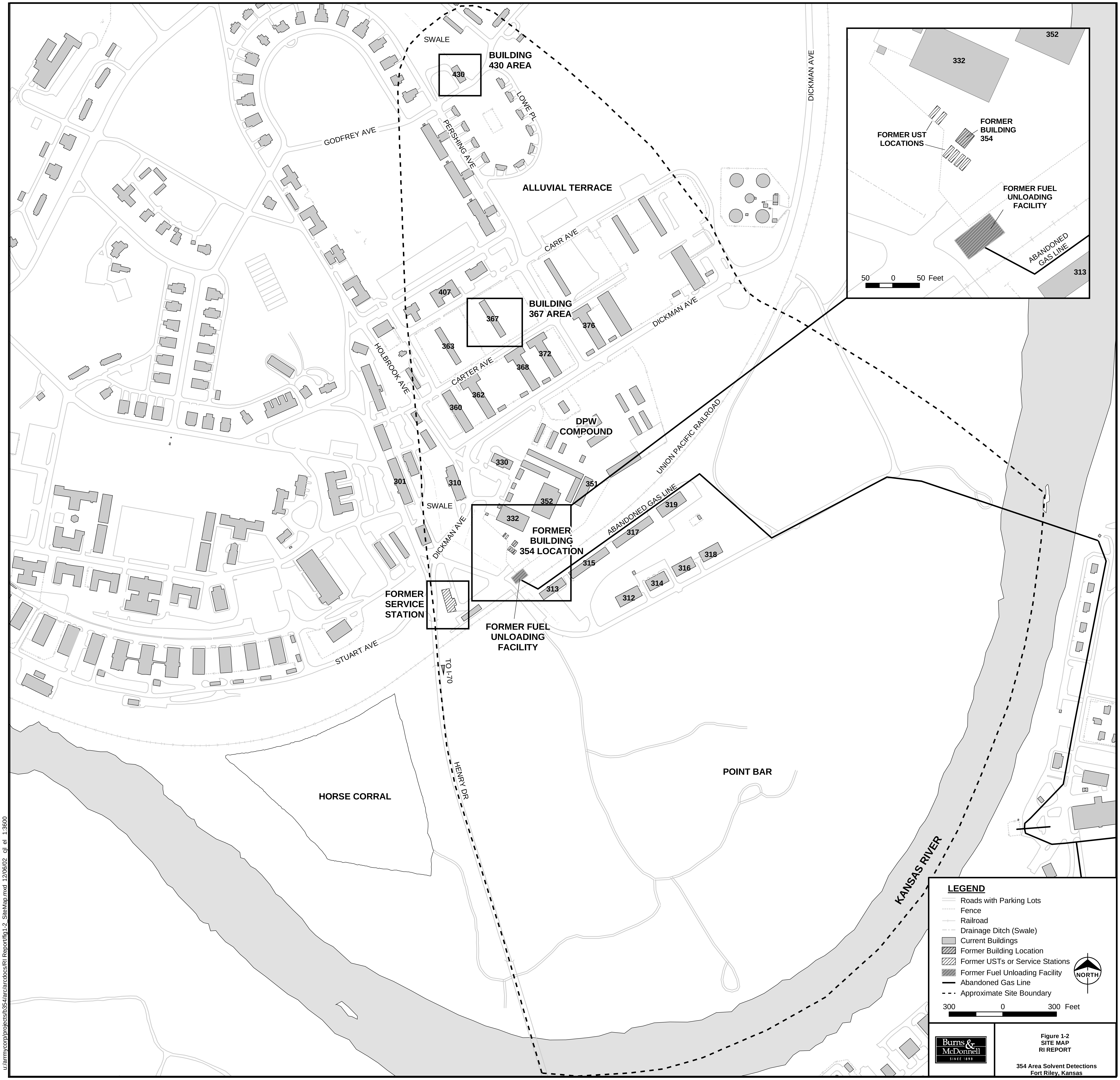
SINCE 1898

Figure 1-1
GENERAL LOCATION MAP
RI REPORT
354 Area Solvent Detections
Fort Riley, Kansas

U:\armycorp\projects\b354\arc\arcdocs\RI Report\Fig1-1 genlocationmap.mxd 1:36000 ssk el 9/10/02



Burns & McDonnell
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Figure 1-2
SITE MAP
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

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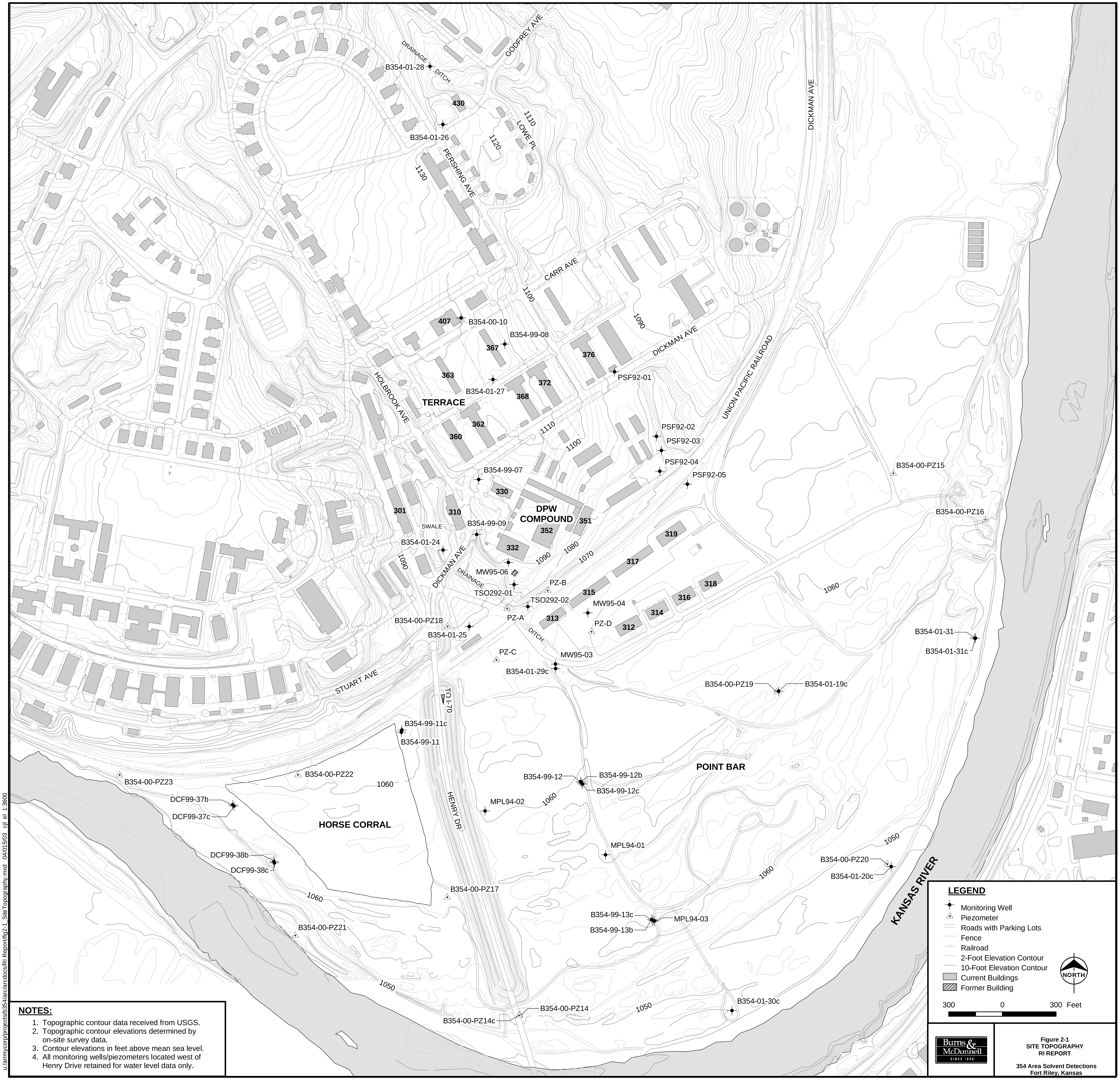

NOTES:

1. Topographic contour data received from USGS.
2. Topographic contour elevations determined by on-site survey data.
3. Contour elevations in feet above mean sea level.
4. All monitoring wells/piezometers located west of Henry Drive retained for water level data only.

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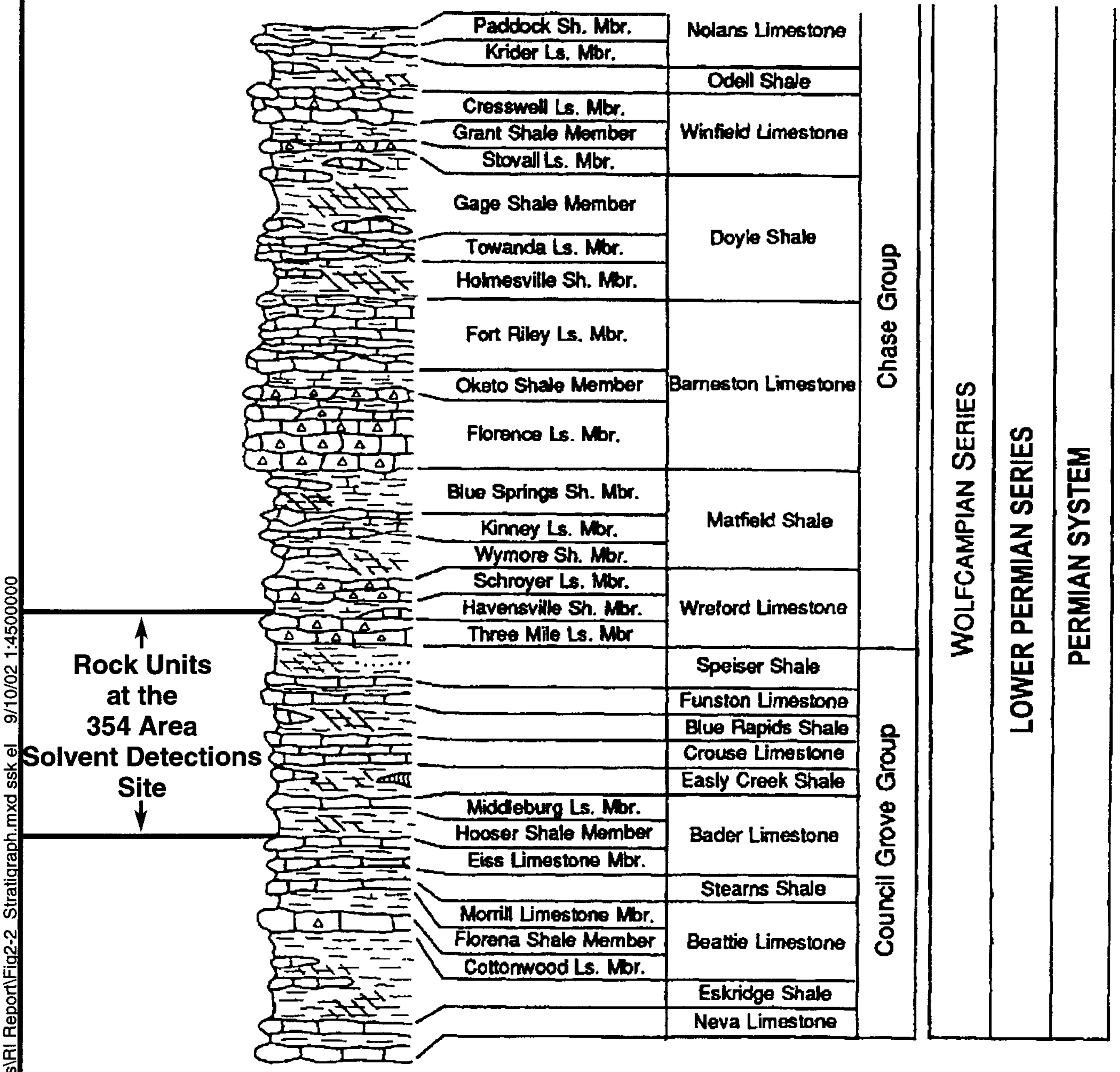
Figure 2-1
SITE TOPOGRAPHY
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig2-1_SiteTopography.mxd 04/015/03 cjl el 1:3600



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Source: Zeller, 1994

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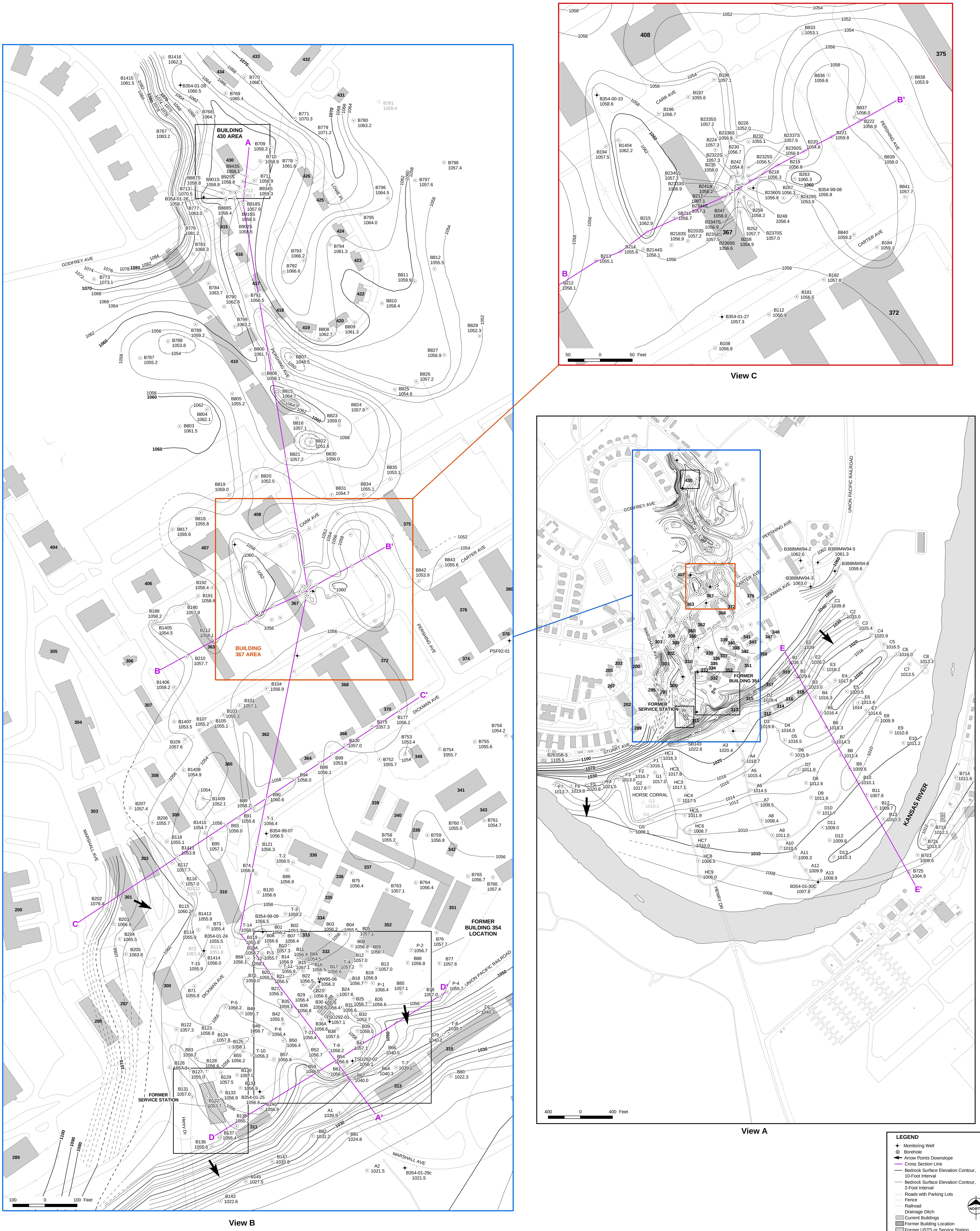
Figure 2-2
FORT RILEY
STRATIGRAPHIC COLUMN
RI REPORT
354 Area Solvent Detections
Fort Riley, Kansas



NOTE:

Faded boring locations represent locations that were not contoured based on analagous elevation readings.

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LEGEND

- ✦ Monitoring Well
- ⊙ Borehole
- ◀ Arrow Points Downslope
- Cross Section Line
- Bedrock Surface Elevation Contour, 10-Foot Interval
- Bedrock Surface Elevation Contour, 2-Foot Interval
- Roads with Parking Lots
- Fence
- Railroad
- Drainage Ditch
- ▭ Current Buildings
- ▨ Former Building Location
- ▨ Former USTS or Service Station

NORTH

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SINCE 1898

Figure 2-3
BEDROCK SURFACE
ELEVATION MAP
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

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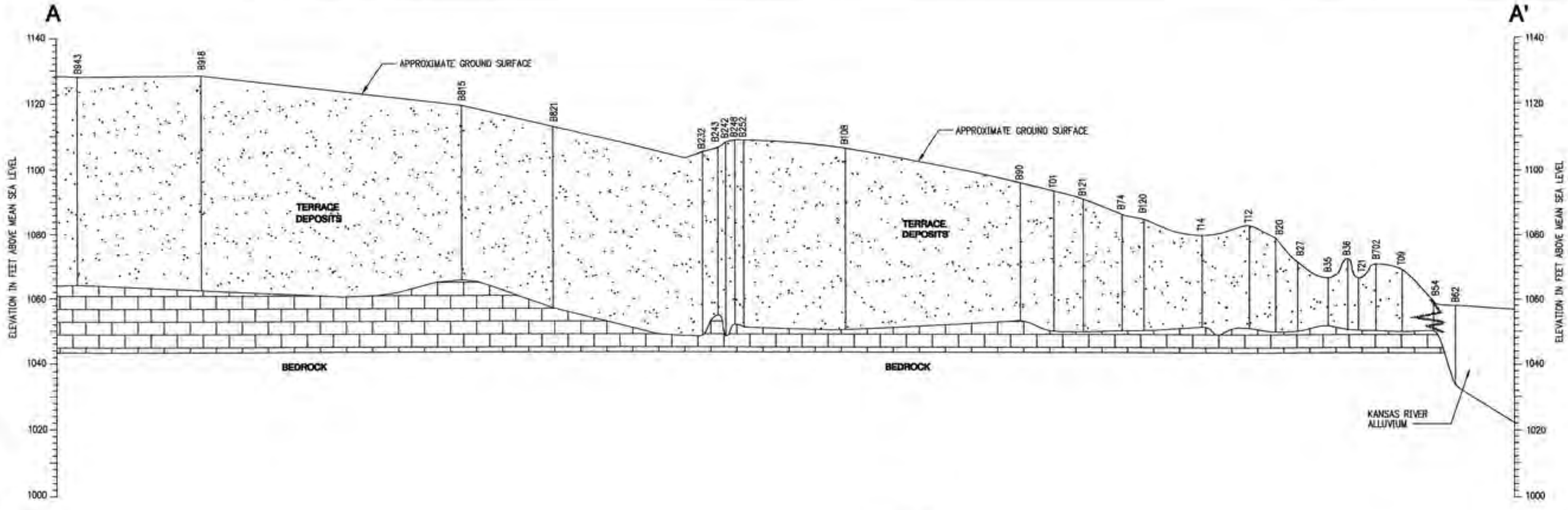


LEGEND

▨ ALLUVIUM/TERRACE DEPOSITS

▦ BEDROCK

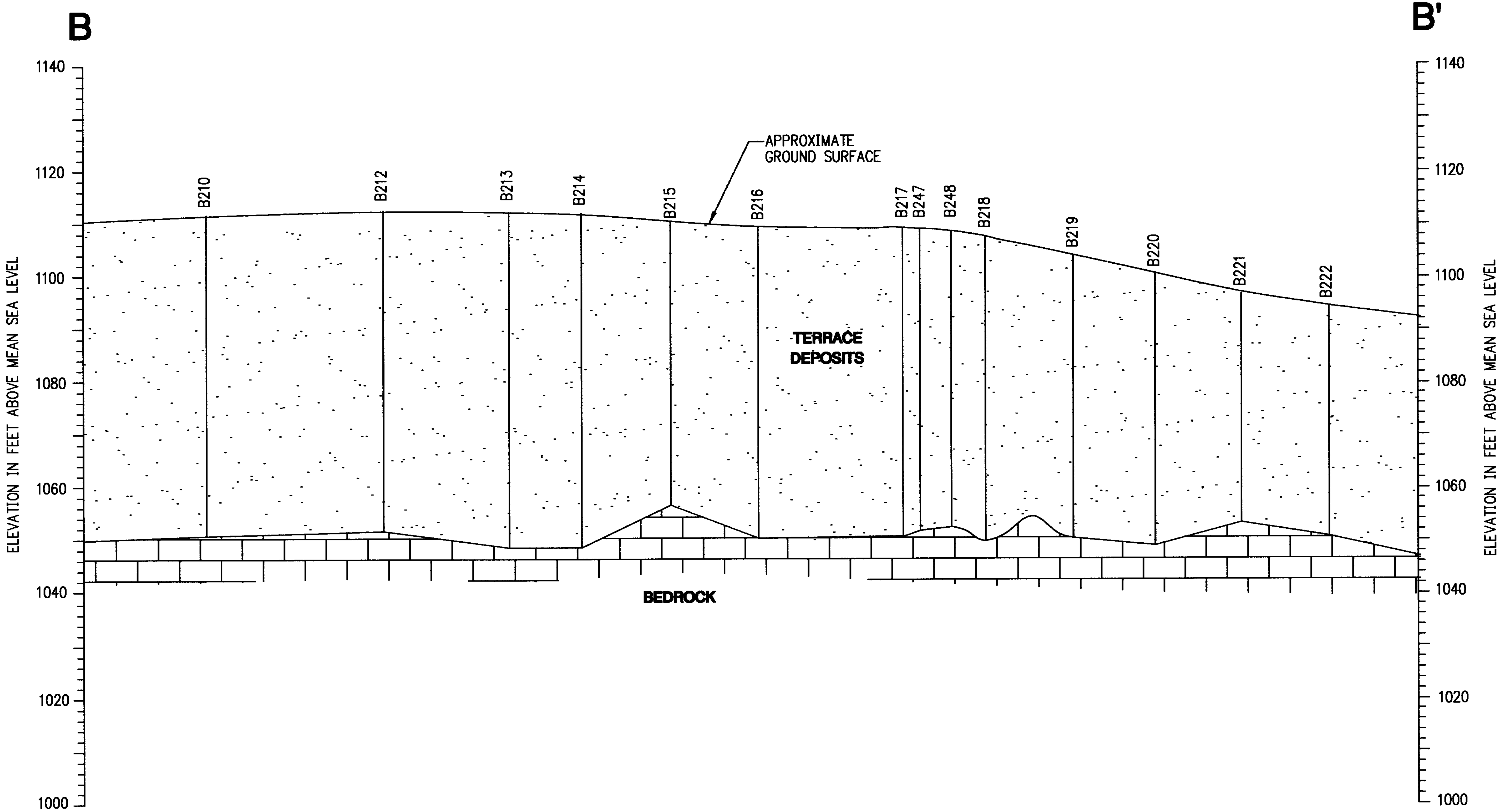
VERTICAL
20 0 20 40
SCALE IN FEET

HORIZONTAL
150 0 150 300
SCALE IN FEET

Burns & McDonnell

Figure 2-4
CROSS SECTION A-A'
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas



LEGEND

⁘	TERRACE DEPOSITS
▦	BEDROCK

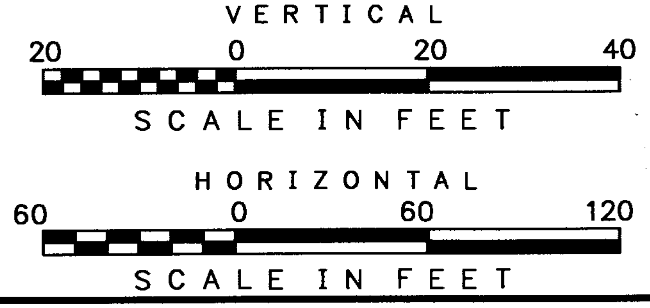


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Figure 2-5
CROSS SECTION B-B'
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

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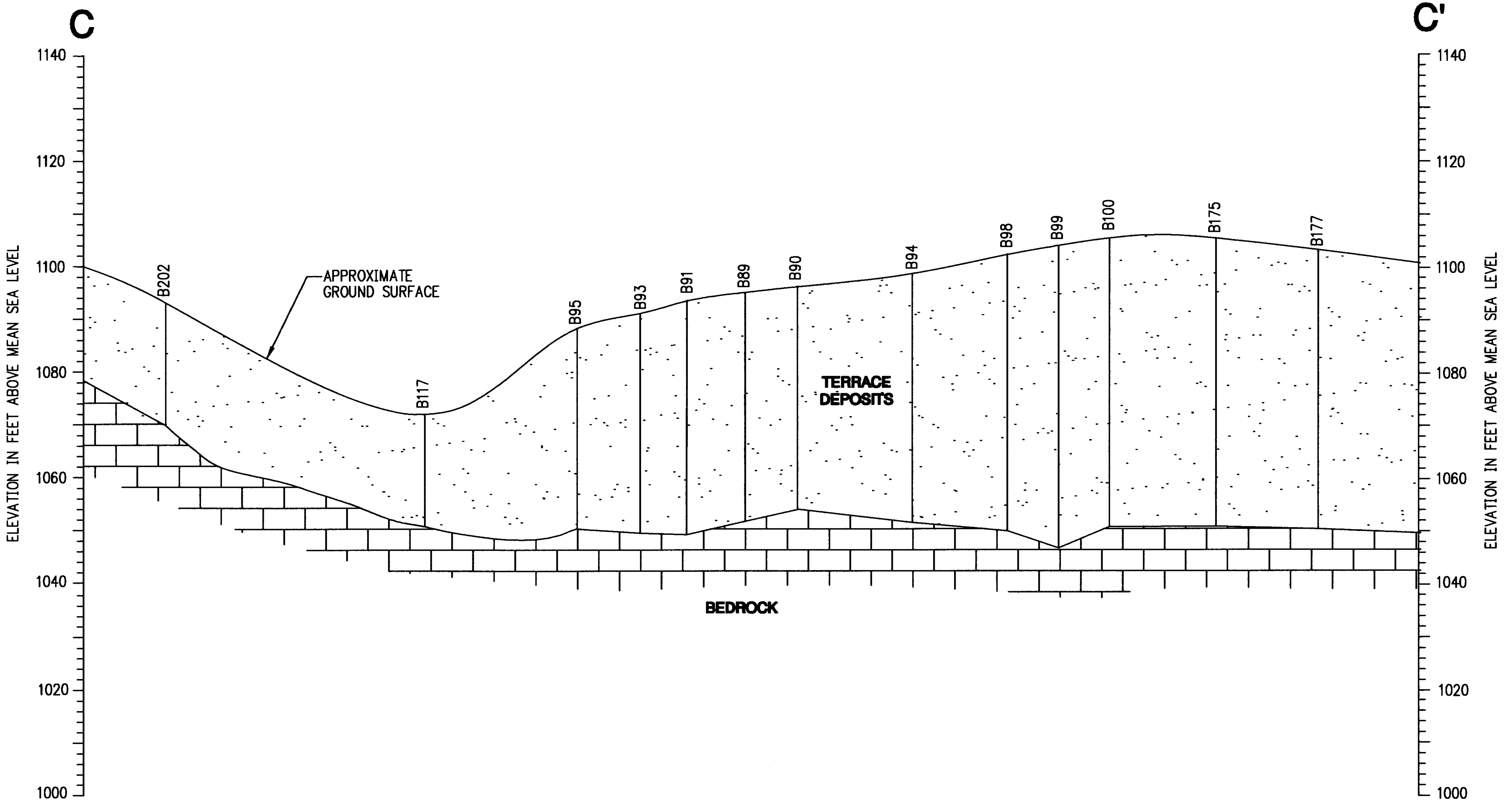

LEGEND

▨ TERRACE DEPOSITS

▦ BEDROCK

VERTICAL
20 0 20 40
SCALE IN FEET

HORIZONTAL
100 0 100 200
SCALE IN FEET

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SINCE 1898

Figure 2-6
CROSS SECTION C-C'
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

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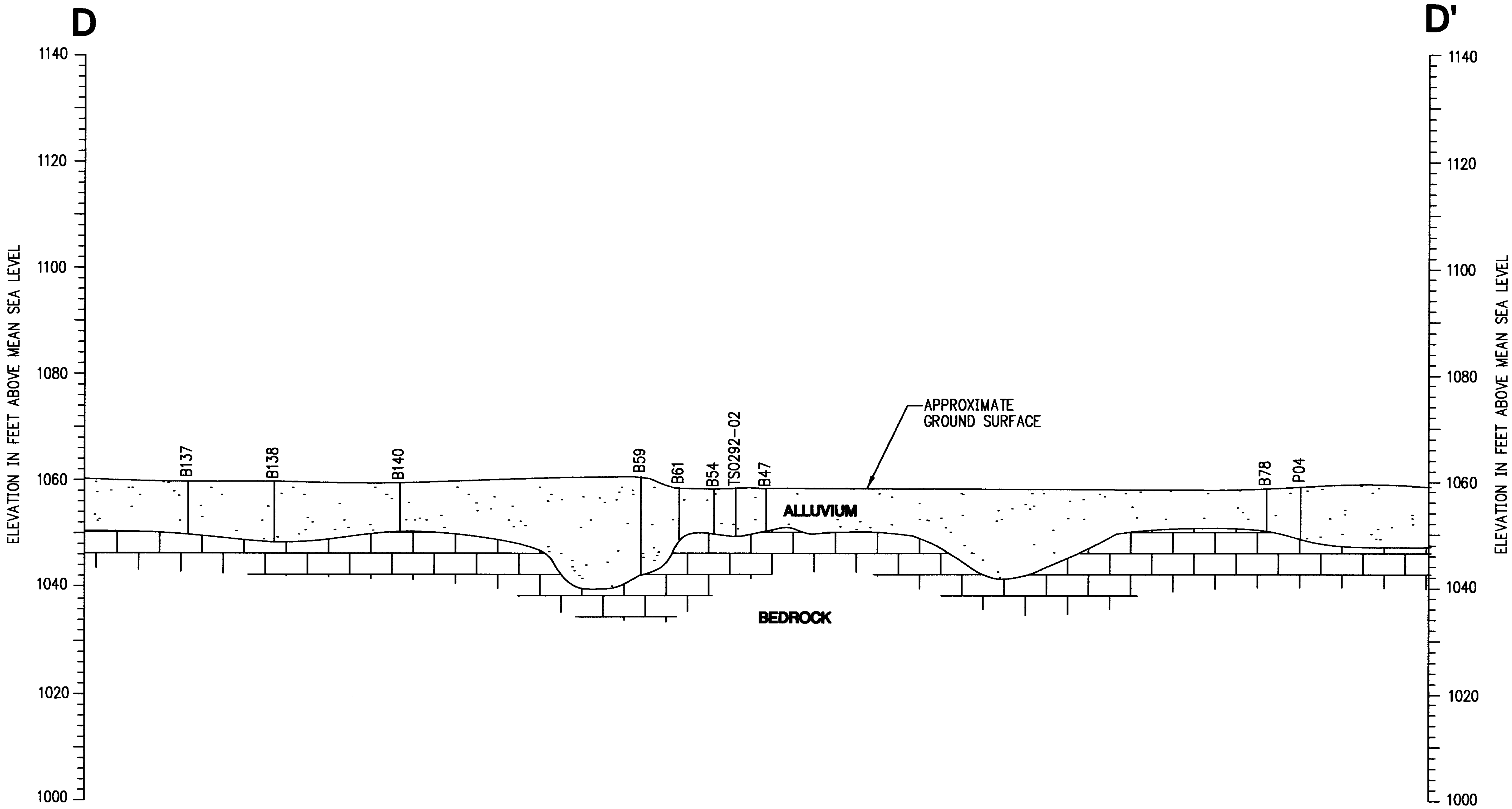

LEGEND

▨ ALLUVIUM

▦ BEDROCK

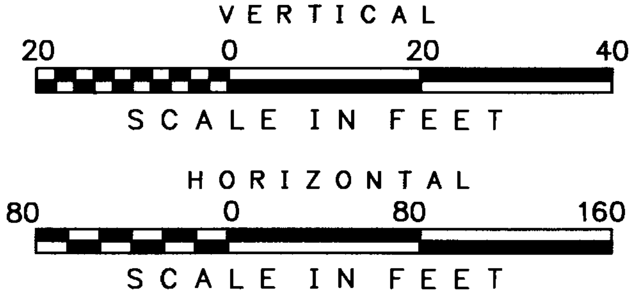

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Figure 2-7
CROSS SECTION D-D'
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

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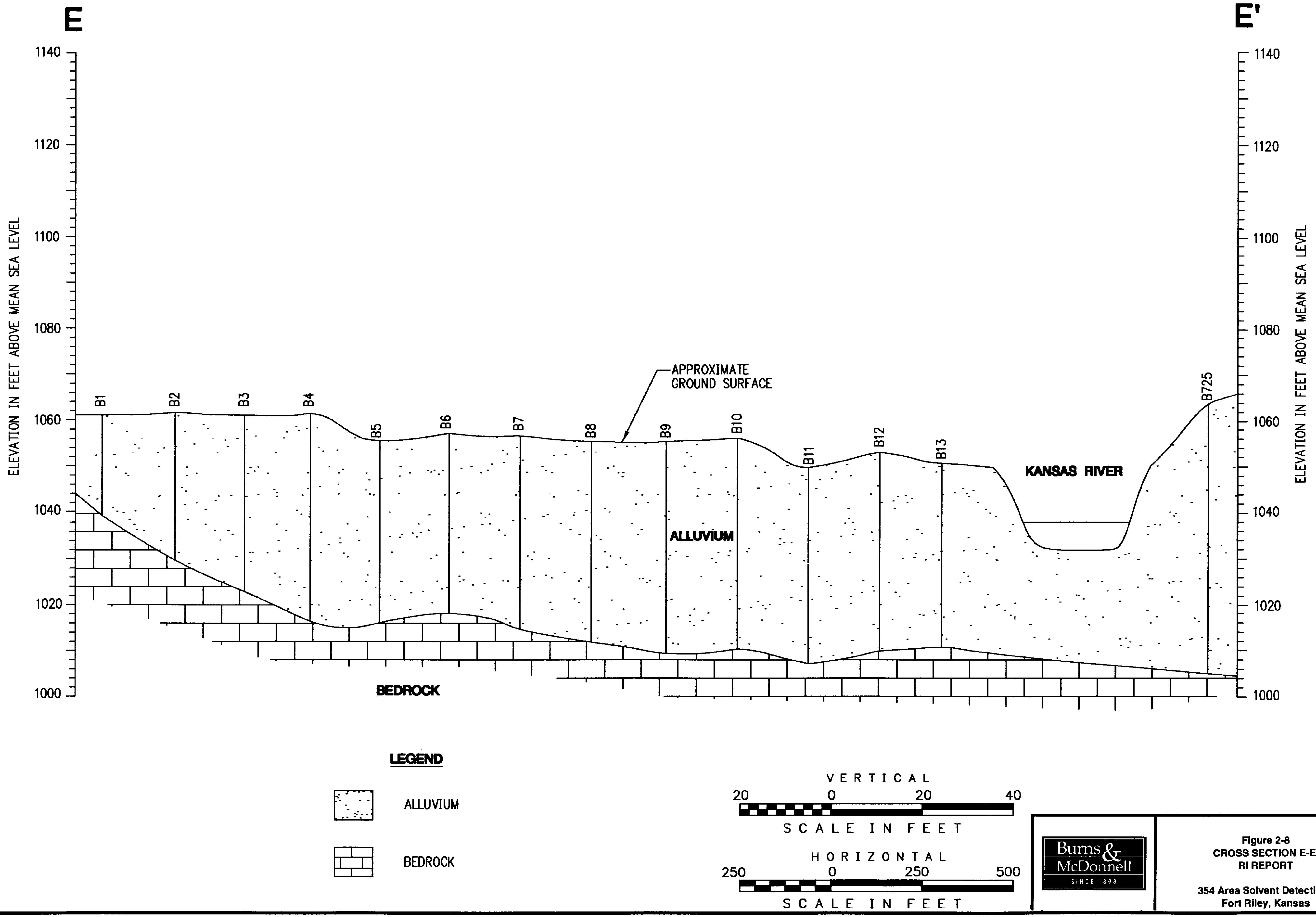

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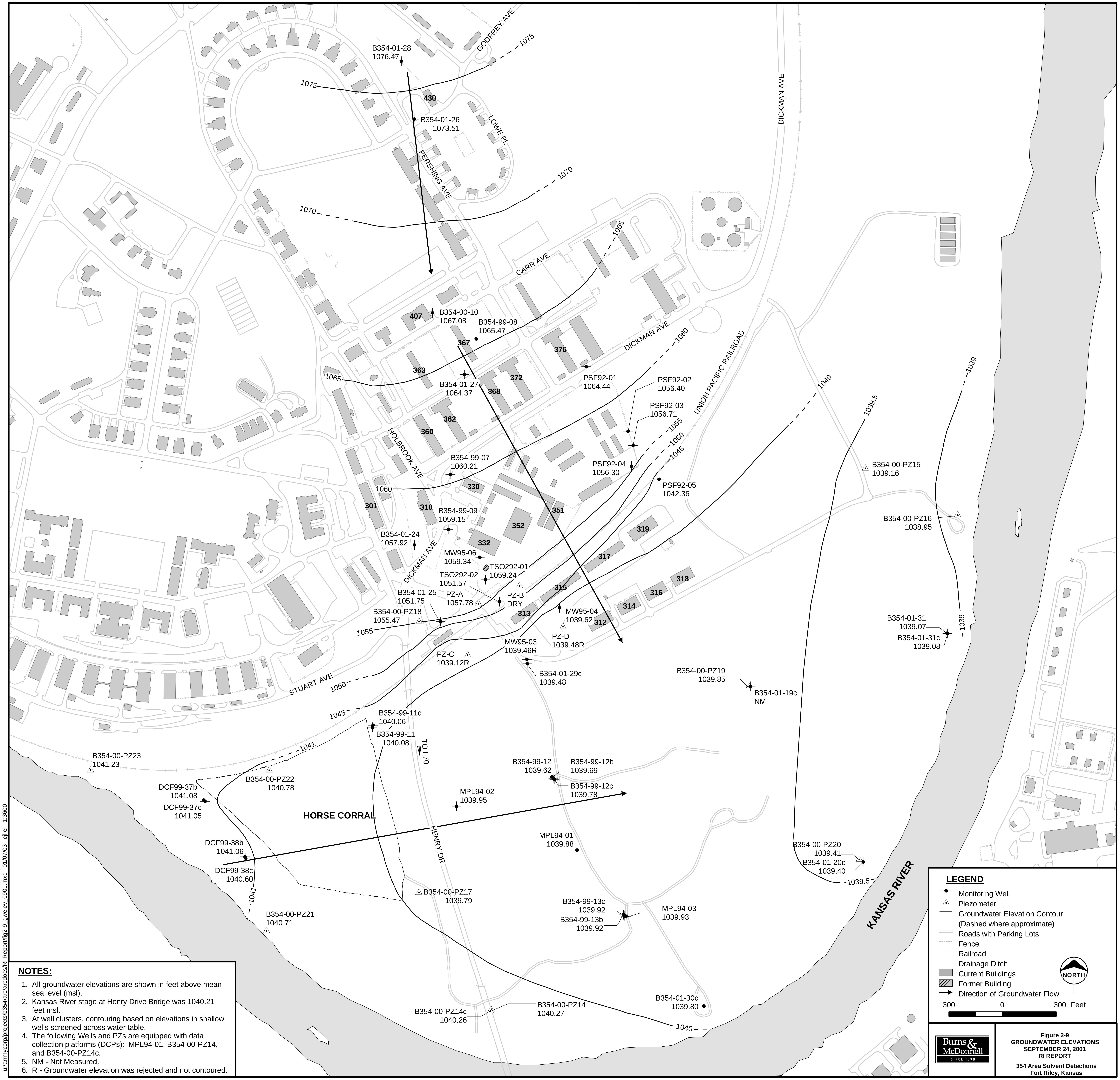
Figure 2-8
CROSS SECTION E-E'
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas



NOTES:

1. All groundwater elevations are shown in feet above mean sea level (msl).
2. Kansas River stage at Henry Drive Bridge was 1040.21 feet msl.
3. At well clusters, contouring based on elevations in shallow wells screened across water table.
4. The following Wells and PZs are equipped with data collection platforms (DCPs): MPL94-01, B354-00-PZ14, and B354-00-PZ14c.
5. NM - Not Measured.
6. R - Groundwater elevation was rejected and not contoured.

LEGEND

- Monitoring Well
- Piezometer
- Groundwater Elevation Contour (Dashed where approximate)
- Roads with Parking Lots
- Fence
- Railroad
- Drainage Ditch
- Current Buildings
- Former Building
- Direction of Groundwater Flow

300 0 300 Feet

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SINCE 1898

Figure 2-9
GROUNDWATER ELEVATIONS
SEPTEMBER 24, 2001
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

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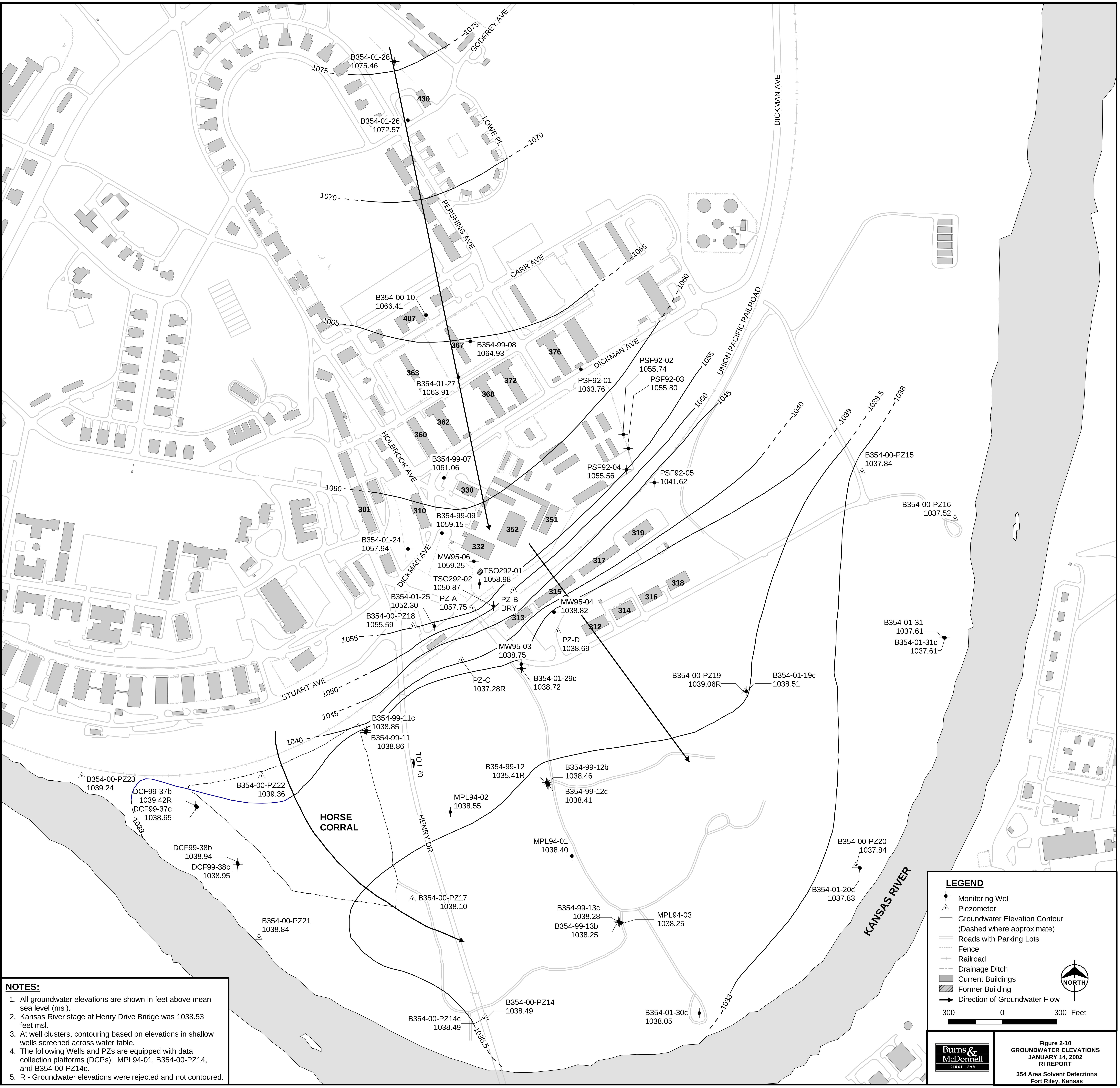

NOTES:

1. All groundwater elevations are shown in feet above mean sea level (msl).
2. Kansas River stage at Henry Drive Bridge was 1038.53 feet msl.
3. At well clusters, contouring based on elevations in shallow wells screened across water table.
4. The following Wells and PZs are equipped with data collection platforms (DCPs): MPL94-01, B354-00-PZ14, and B354-00-PZ14c.
5. R - Groundwater elevations were rejected and not contoured.

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Figure 2-10
GROUNDWATER ELEVATIONS
JANUARY 14, 2002
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

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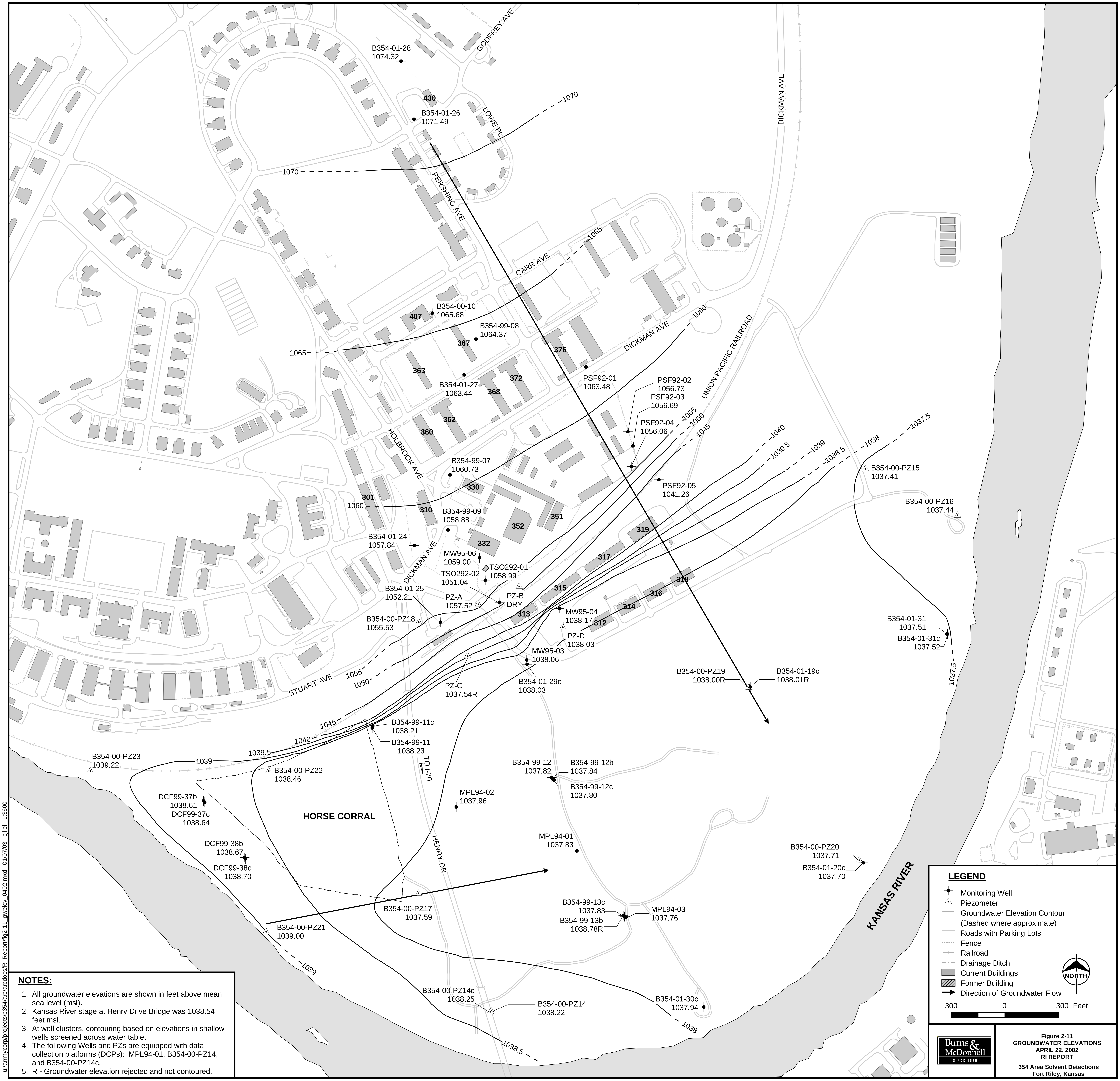

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig2-11_gwelev_0402.mxd 01/07/03 cjel 1:3600

NOTES:

1. All groundwater elevations are shown in feet above mean sea level (msl).
2. Kansas River stage at Henry Drive Bridge was 1038.54 feet msl.
3. At well clusters, contouring based on elevations in shallow wells screened across water table.
4. The following Wells and PZs are equipped with data collection platforms (DCPs): MPL94-01, B354-00-PZ14, and B354-00-PZ14c.
5. R - Groundwater elevation rejected and not contoured.

LEGEND

✦	Monitoring Well
△	Piezometer
—	Groundwater Elevation Contour (Dashed where approximate)
═	Roads with Parking Lots
- - -	Fence
-+-	Railroad
- · -	Drainage Ditch
■	Current Buildings
▨	Former Building
→	Direction of Groundwater Flow

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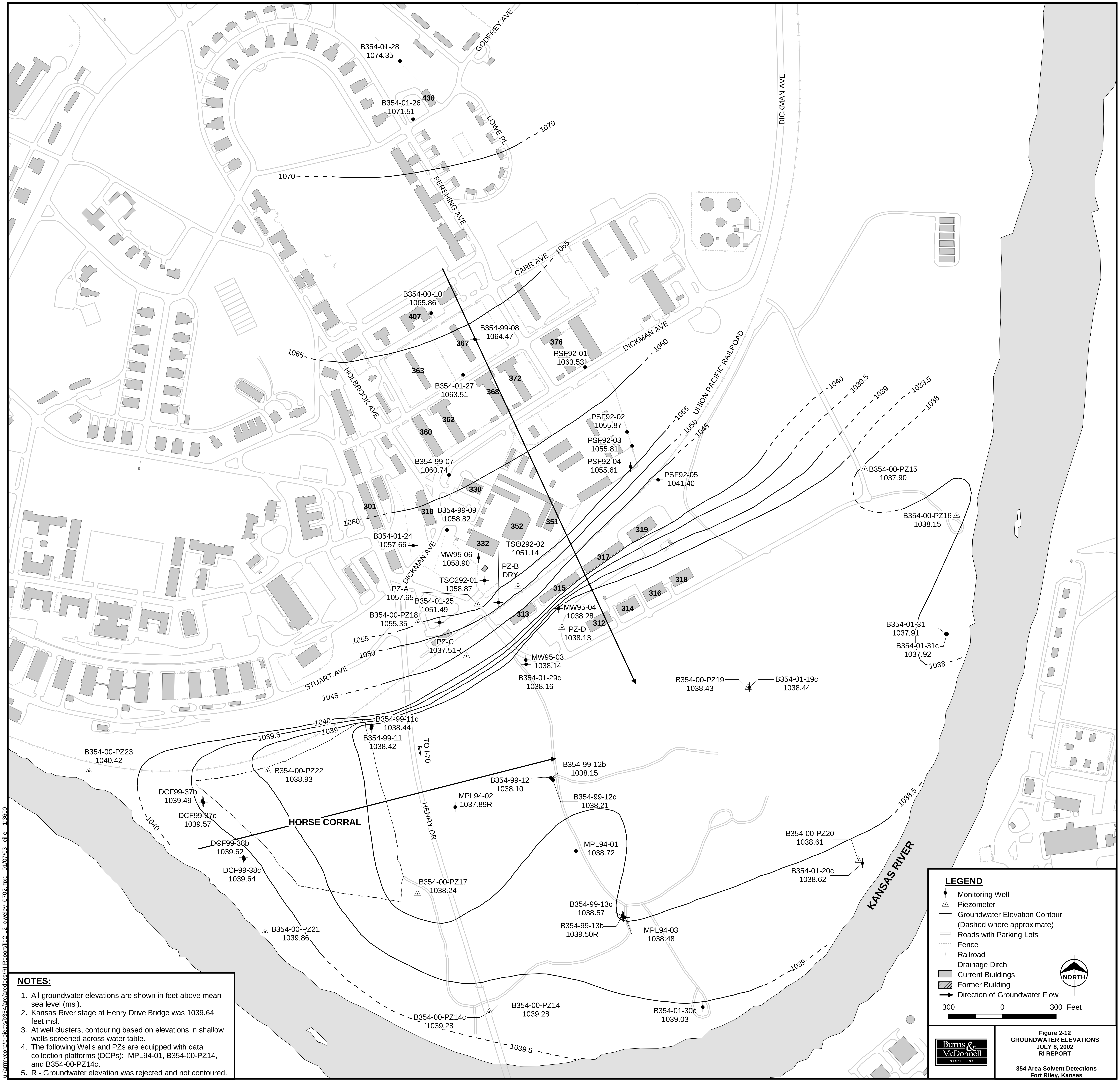
SINCE 1898

Figure 2-11
GROUNDWATER ELEVATIONS
APRIL 22, 2002
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas



NOTES:

1. All groundwater elevations are shown in feet above mean sea level (msl).
2. Kansas River stage at Henry Drive Bridge was 1039.64 feet msl.
3. At well clusters, contouring based on elevations in shallow wells screened across water table.
4. The following Wells and PZs are equipped with data collection platforms (DCPs): MPL94-01, B354-00-PZ14, and B354-00-PZ14c.
5. R - Groundwater elevation was rejected and not contoured.

LEGEND

- ✦ Monitoring Well
- △ Piezometer
- — Groundwater Elevation Contour (Dashed where approximate)
- Roads with Parking Lots
- Fence
- Railroad
- Drainage Ditch
- ▭ Current Buildings
- ▨ Former Building
- → Direction of Groundwater Flow

NORTH

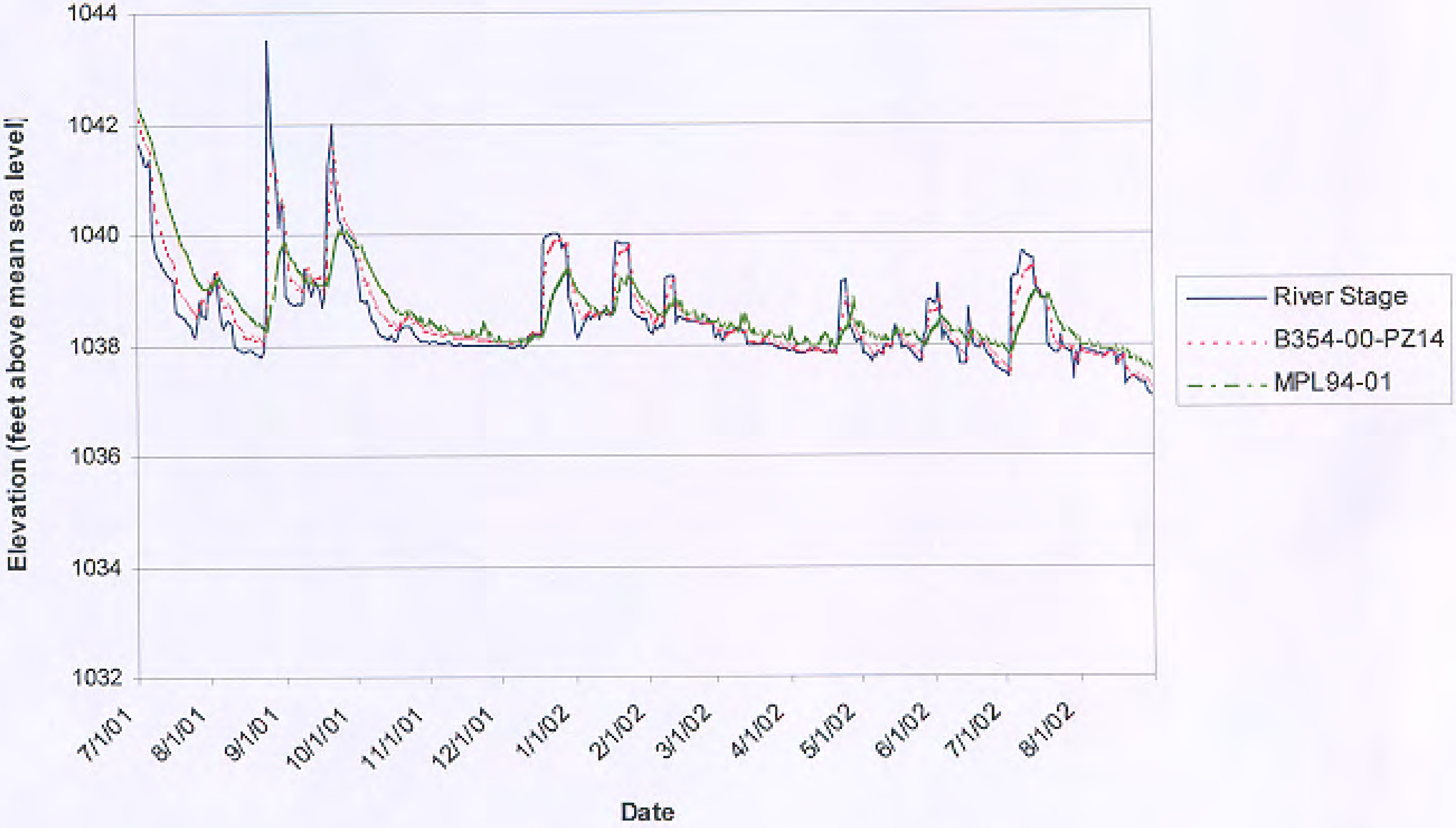
300 0 300 Feet

Burns & McDonnell
SINCE 1898

Figure 2-12
GROUNDWATER ELEVATIONS
JULY 8, 2002
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig2-12 gwelev 0702.mxd 01/07/03 cil el 1:3600



NOTES:

1. River stage measurements taken at Henry Drive bridge.
2. Monitoring Wells B354-00-PZ14 and MPL94-01 are equipped with data collection platforms (DCPs).

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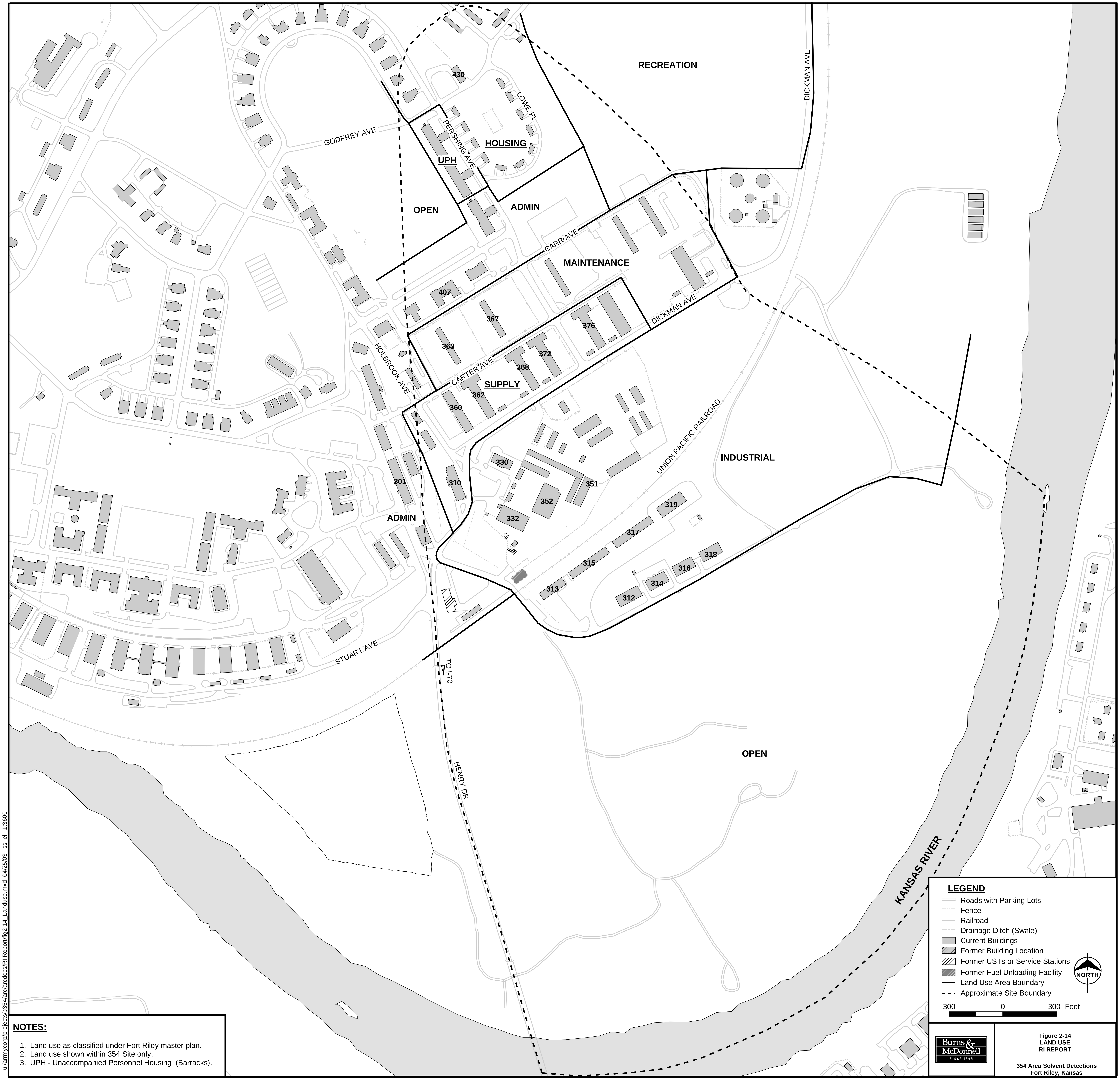
SINCE 1898

FIGURE 2-13
KANSAS RIVER STAGE AND
WATER-LEVEL ELEVATIONS
RI REPORT
354 AREA SOLVENT DETECTIONS
FORT RILEY, KANSAS

u:/armycorp/projects/b354/arc/arcdocs/ri_report/Fig2-13_KS_River_WL_Elev.mxd_cjl_el 01/09/03



LEGEND

- Roads with Parking Lots
- Fence
- Railroad
- Drainage Ditch (Swale)
- ▭ Current Buildings
- ▨ Former Building Location
- ▨ Former USTs or Service Stations
- ▨ Former Fuel Unloading Facility
- Land Use Area Boundary
- Approximate Site Boundary

NOTES:

1. Land use as classified under Fort Riley master plan.
2. Land use shown within 354 Site only.
3. UPH - Unaccompanied Personnel Housing (Barracks).

Burns & McDonnell
SINCE 1898

Figure 2-14
LAND USE
RI REPORT

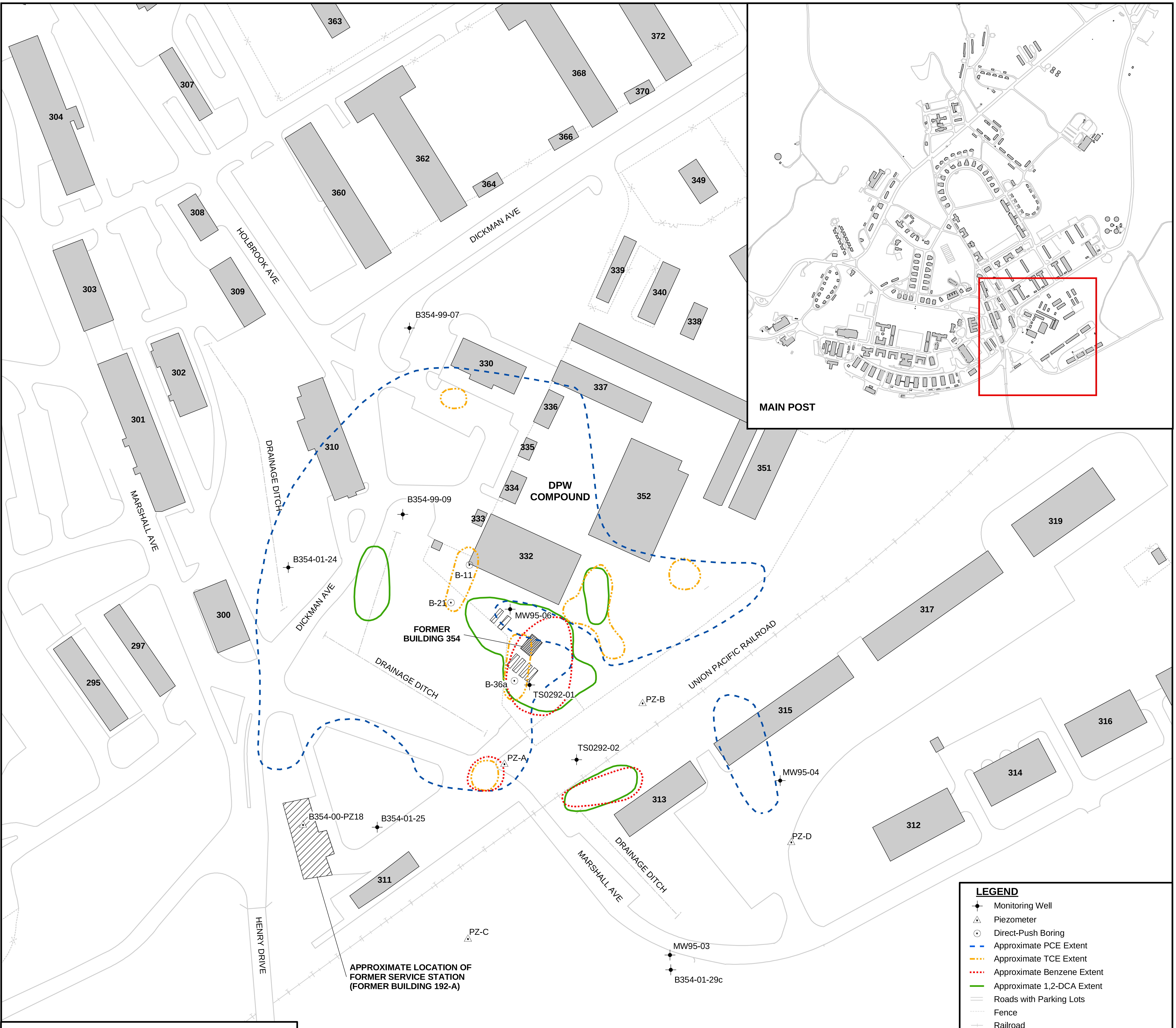
354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig2-14_Landuse.mxd 04/25/03 ss el 1:3600

Figure 2-15
ECOSYSTEMS
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/ri_report/fig2-15_ecosystem.mxd 07/22/03 cjl el 1:3000 rev cjl 10/21/03



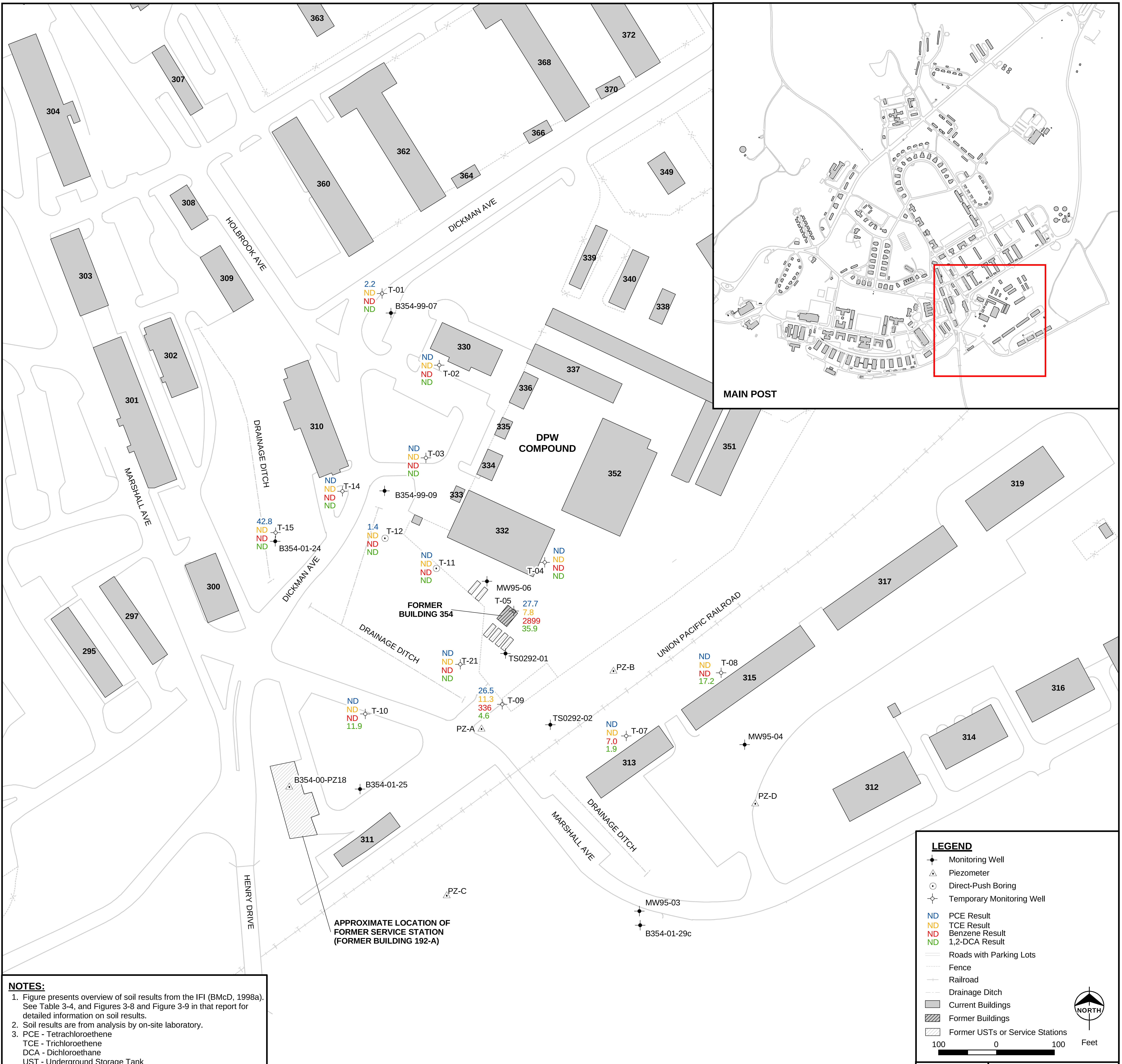
U:\armycorp\Projects\b354\ARC\ArcDocs\RI Report\Fig3-1_Chris.mxd cgb el 12/06/02 1:1,200

NOTES:

1. Figure presents overview of soil-gas results from the IFI (BMcD, 1998a). See Table 3-3 and Figures 3-4 through 3-7 in that report for detailed information on soil-gas results.
2. Soil-gas results are from analysis by on-site laboratory.
3. Only those direct-push borings referred to in the RI Report text are depicted on this figure (B-11, B-21 and B-36a). Figure based on soil-gas results from 78 direct-push borings.
4. PCE - Tetrachloroethene
   TCE - Trichloroethene
   DCA - Dichloroethane
   UST - Underground Storage Tank
5. Monitoring well network is depicted as it existed in September 2002.

Burns & McDonnell
SINCE 1898

Figure 3-1
PCE, TCE, BENZENE &
1,2-DCA IN SOIL GAS
1997 IFI FIELD SCREENING RESULTS
RI REPORT
354 Area Solvent Detections
Fort Riley, Kansas



NOTES:

1. Figure presents overview of soil results from the IFI (BMcD, 1998a). See Table 3-4, and Figures 3-8 and Figure 3-9 in that report for detailed information on soil results.
2. Soil results are from analysis by on-site laboratory.
3. PCE - Tetrachloroethene
   TCE - Trichloroethene
   DCA - Dichloroethane
   UST - Underground Storage Tank
4. Concentrations in micrograms per kilogram (ug/kg).
5. ND - Not Detected (<0.1 ug/kg).
6. Field duplicate run on T-10: Benzene = ND, 1,2-DCA = 6.5 ug/kg, TCE = ND, PCE = ND
7. Monitoring well network is depicted as it existed in September 2002.

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SINCE 1898

Figure 3-2
PCE, TCE, BENZENE &
1,2-DCA IN SOIL
1997 IFI FIELD SCREENING RESULTS
RI REPORT
354 Area Solvent Detections
Fort Riley, Kansas

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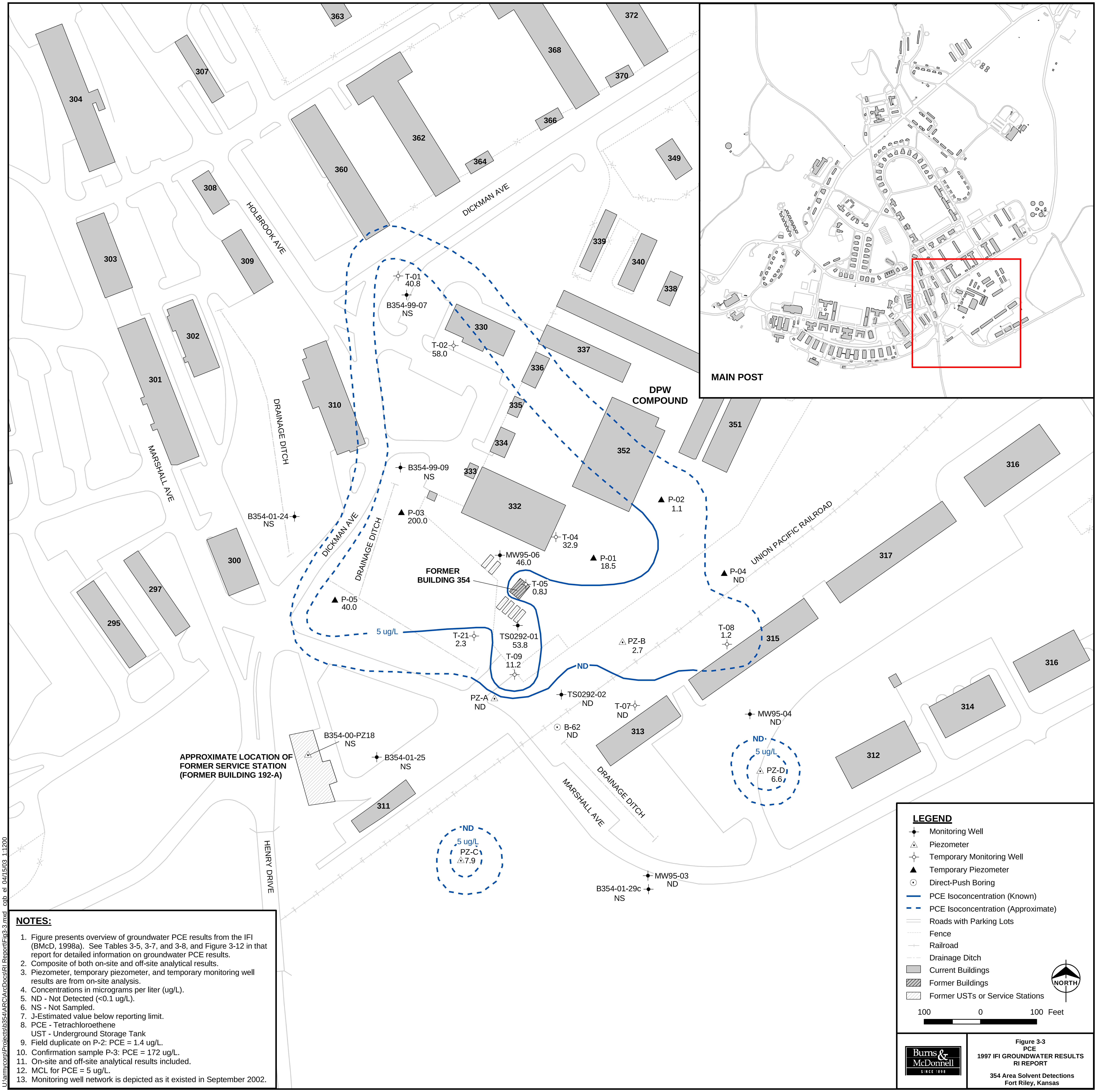


U:\armycorp\Projects\b354\ARC\ArcDocs\RI Report\Fig3-3.mxd cgb el 04/15/03 1:1200

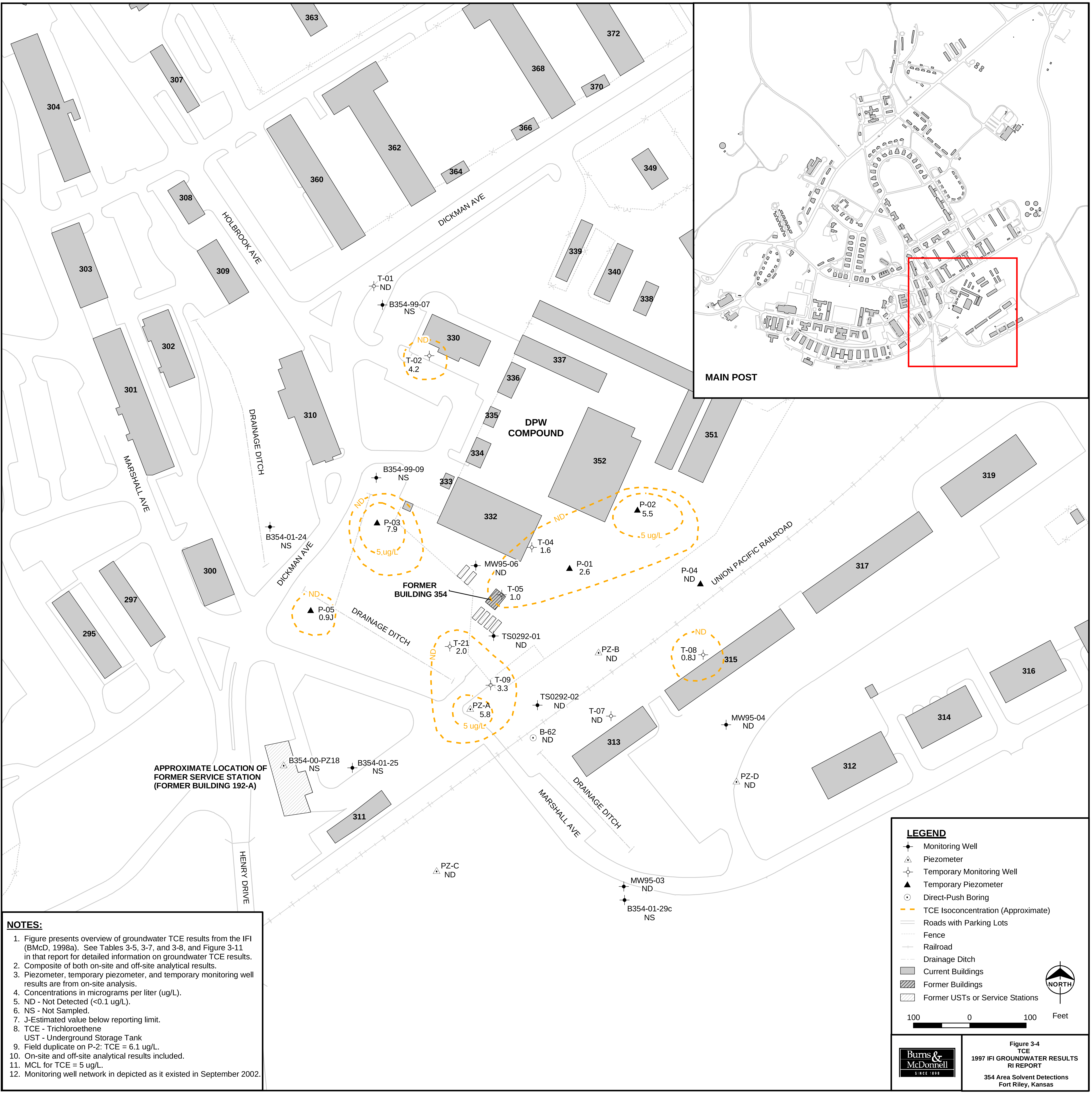
NOTES:

1. Figure presents overview of groundwater PCE results from the IFI (BMcD, 1998a). See Tables 3-5, 3-7, and 3-8, and Figure 3-12 in that report for detailed information on groundwater PCE results.
2. Composite of both on-site and off-site analytical results.
3. Piezometer, temporary piezometer, and temporary monitoring well results are from on-site analysis.
4. Concentrations in micrograms per liter (ug/L).
5. ND - Not Detected (<0.1 ug/L).
6. NS - Not Sampled.
7. J-Estimated value below reporting limit.
8. PCE - Tetrachloroethene
   UST - Underground Storage Tank
9. Field duplicate on P-2: PCE = 1.4 ug/L.
10. Confirmation sample P-3: PCE = 172 ug/L.
11. On-site and off-site analytical results included.
12. MCL for PCE = 5 ug/L.
13. Monitoring well network is depicted as it existed in September 2002.

Burns & McDonnell
SINCE 1898

Figure 3-3
PCE
1997 IFI GROUNDWATER RESULTS
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas



U:\armycorp\Projects\b354\ARC\ArcDocs\RI Report\Fig3-4.mxd cgb el 04/15/03 1:1,200

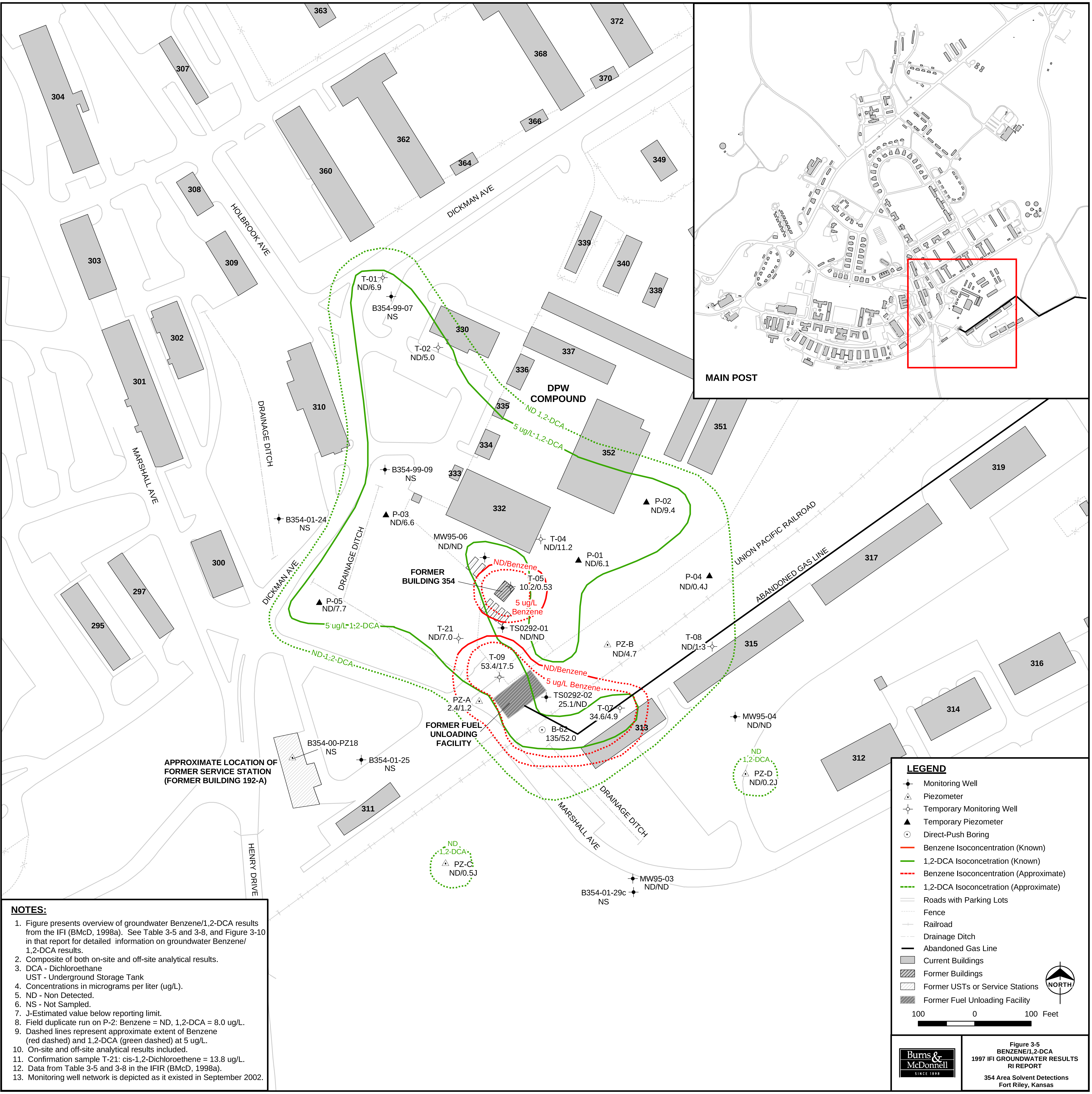
NOTES:

1. Figure presents overview of groundwater TCE results from the IFI (BMcD, 1998a). See Tables 3-5, 3-7, and 3-8, and Figure 3-11 in that report for detailed information on groundwater TCE results.
2. Composite of both on-site and off-site analytical results.
3. Piezometer, temporary piezometer, and temporary monitoring well results are from on-site analysis.
4. Concentrations in micrograms per liter (ug/L).
5. ND - Not Detected (<0.1 ug/L).
6. NS - Not Sampled.
7. J-Estimated value below reporting limit.
8. TCE - Trichloroethene
   UST - Underground Storage Tank
9. Field duplicate on P-2: TCE = 6.1 ug/L.
10. On-site and off-site analytical results included.
11. MCL for TCE = 5 ug/L.
12. Monitoring well network in depicted as it existed in September 2002.

Burns & McDonnell
SINCE 1898

Figure 3-4
TCE
1997 IFI GROUNDWATER RESULTS
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas



NOTES:

1. Figure presents overview of groundwater Benzene/1,2-DCA results from the IFI (BMcD, 1998a). See Table 3-5 and 3-8, and Figure 3-10 in that report for detailed information on groundwater Benzene/ 1,2-DCA results.
2. Composite of both on-site and off-site analytical results.
3. DCA - Dichloroethane
   UST - Underground Storage Tank
4. Concentrations in micrograms per liter (ug/L).
5. ND - Non Detected.
6. NS - Not Sampled.
7. J- Estimated value below reporting limit.
8. Field duplicate run on P-2: Benzene = ND, 1,2-DCA = 8.0 ug/L.
9. Dashed lines represent approximate extent of Benzene (red dashed) and 1,2-DCA (green dashed) at 5 ug/L.
10. On-site and off-site analytical results included.
11. Confirmation sample T-21: cis-1,2-Dichloroethene = 13.8 ug/L.
12. Data from Table 3-5 and 3-8 in the IFIR (BMcD, 1998a).
13. Monitoring well network is depicted as it existed in September 2002.

LEGEND

- ⌖ Monitoring Well
- △ Piezometer
- ⌖ Temporary Monitoring Well
- ▲ Temporary Piezometer
- ⊙ Direct-Push Boring
- ━ Benzene Isoconcentration (Known)
- ━ 1,2-DCA Isoconcetration (Known)
- ┅ Benzene Isoconcentration (Approximate)
- ┅ 1,2-DCA Isoconcetration (Approximate)
- Roads with Parking Lots
- Fence
- Railroad
- Drainage Ditch
- ━ Abandoned Gas Line
- ▭ Current Buildings
- ▨ Former Buildings
- ▨ Former USTs or Service Stations
- ▨ Former Fuel Unloading Facility

100 0 100 Feet

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SINCE 1898

Figure 3-5
BENZENE/1,2-DCA
1997 IFI GROUNDWATER RESULTS
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

U:\armycorp\Projects\b354\ARC\ArcDocs\RI Report\Fig3-5.mxd cjl el 01/07/03 1:1200

LEGEND

- ⊙ Direct-Push Groundwater Screening Locations
- ═ Roads with Parking Lots
- ▭ Current Buildings

NORTH

100 0 100 Feet

Burns & McDonnell SINCE 1898

Figure 4-1
ADDITIONAL DIRECT-PUSH GROUNDWATER SCREENING LOCATIONS
MAY/JUNE 2001
RI REPORT
354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig4-1additionalgwcreeninglocations.mxd 01/06/03 CJL EL 1:1200

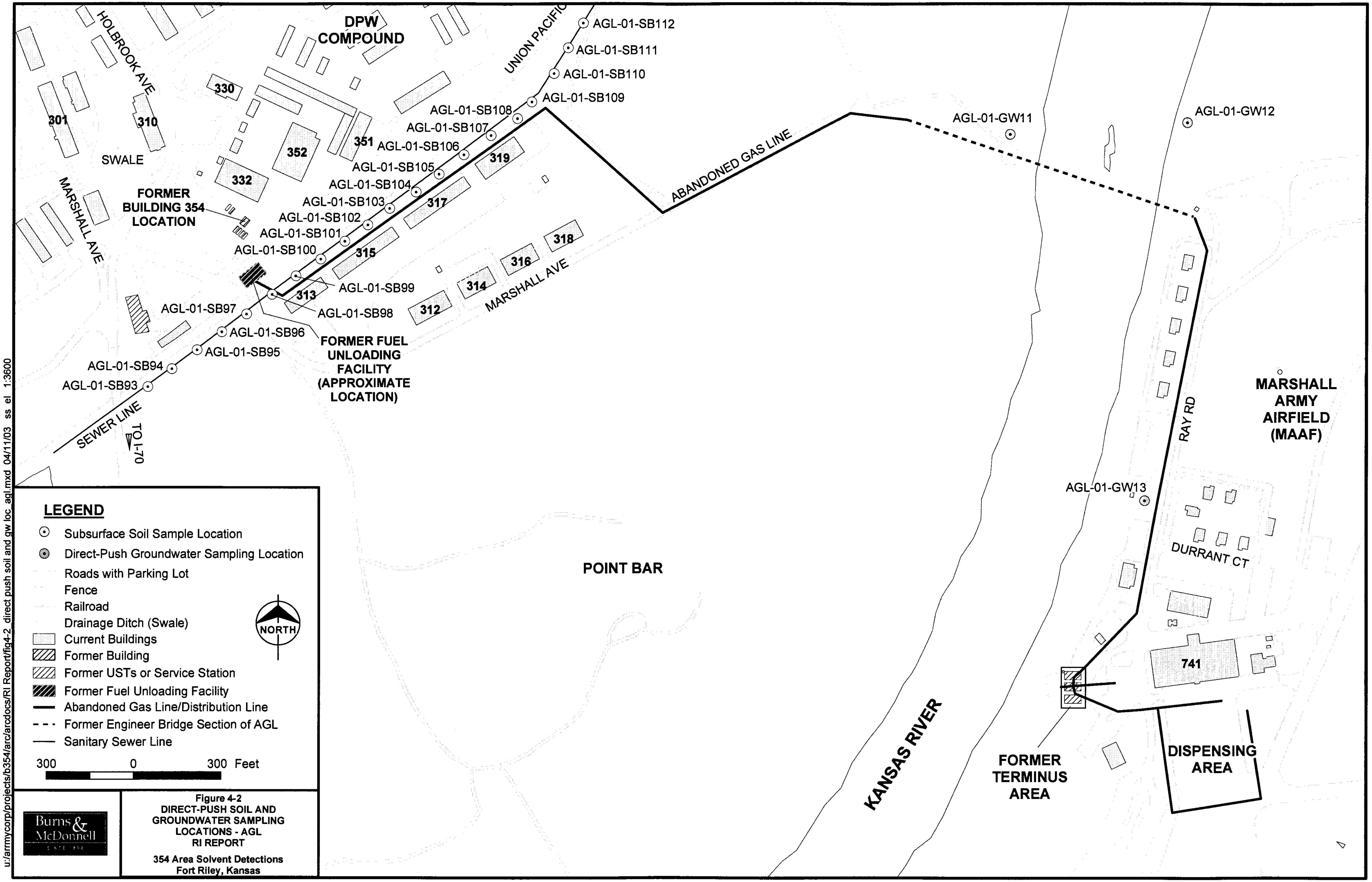
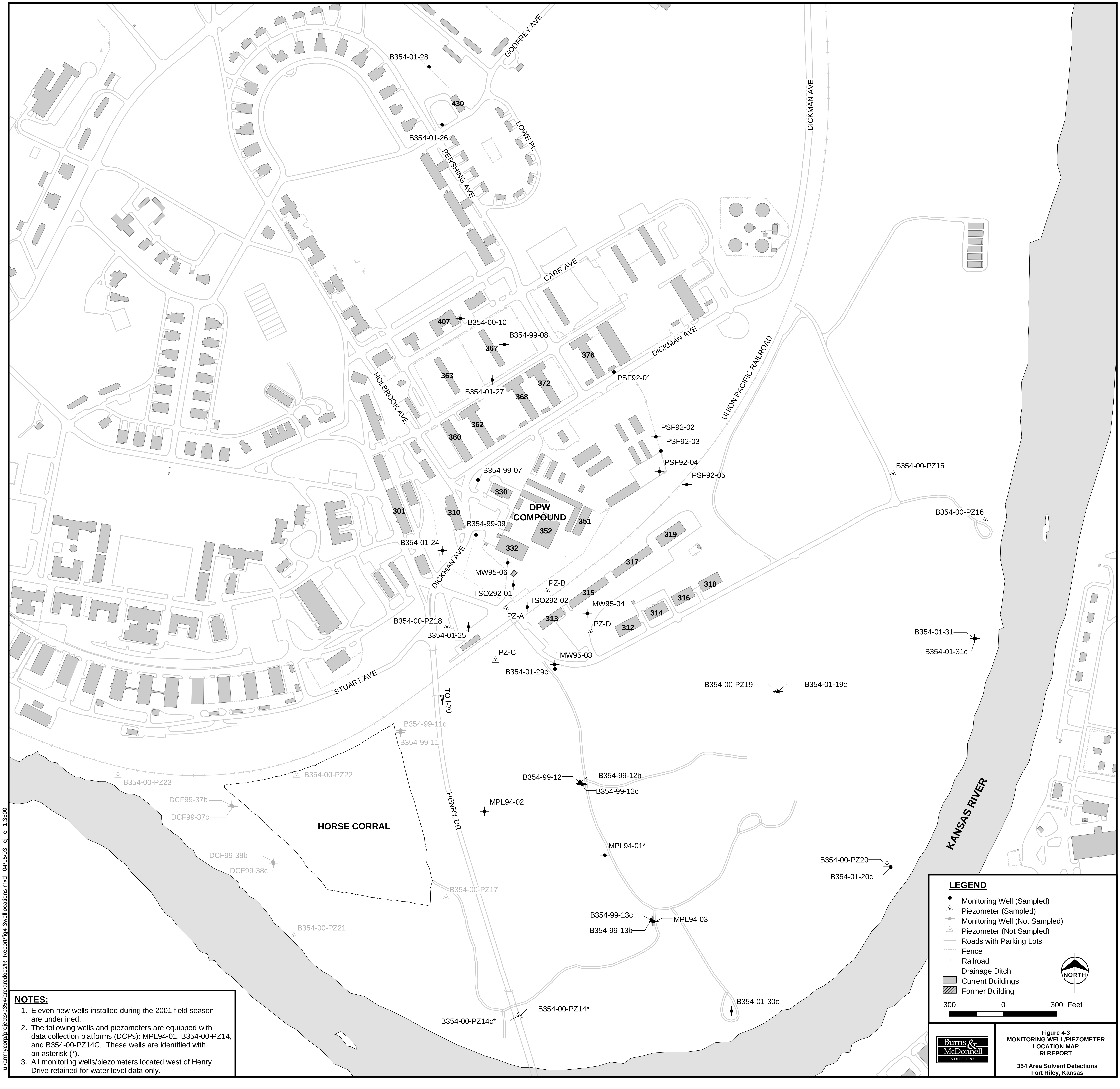


Figure 4-2
DIRECT-PUSH SOIL AND GROUNDWATER SAMPLING LOCATIONS - AGL
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig4-2 direct push soil and gw loc agl.mxd 04/11/03 ss el 1:3600



NOTES:

1. Eleven new wells installed during the 2001 field season are underlined.
2. The following wells and piezometers are equipped with data collection platforms (DCPs): MPL94-01, B354-00-PZ14, and B354-00-PZ14C. These wells are identified with an asterisk (*).
3. All monitoring wells/piezometers located west of Henry Drive retained for water level data only.

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Figure 4-3
MONITORING WELL/PIEZOMETER
LOCATION MAP
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig4-3welllocations.mxd 04/15/03 cjl el 1:3600

LEGEND

- ⊙ Direct-Push Soil-Gas Sampling Location
- ═ Roads with Parking Lots
- ▨ Current Buildings

NOTE:

1. Sampling locations B892, B1079, B1087, B1136 and B10631 are located approximately. These locations were not recovered during survey.

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Figure 4-4
SOIL-GAS SCREENING LOCATIONS
BUILDING 430
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig4-4soilgasscreeninglocations.mxd 09/23/02 KRN EL 1:240

LEGEND

⊙ Direct-Push Sampling Location

═ Roads with Parking Lots

▨ Current Buildings

NOTE:

1. Direct-Push Borings B1398, B1399, B1400, B1401, B1402 and B1403 were placed along the sanitary sewer line.

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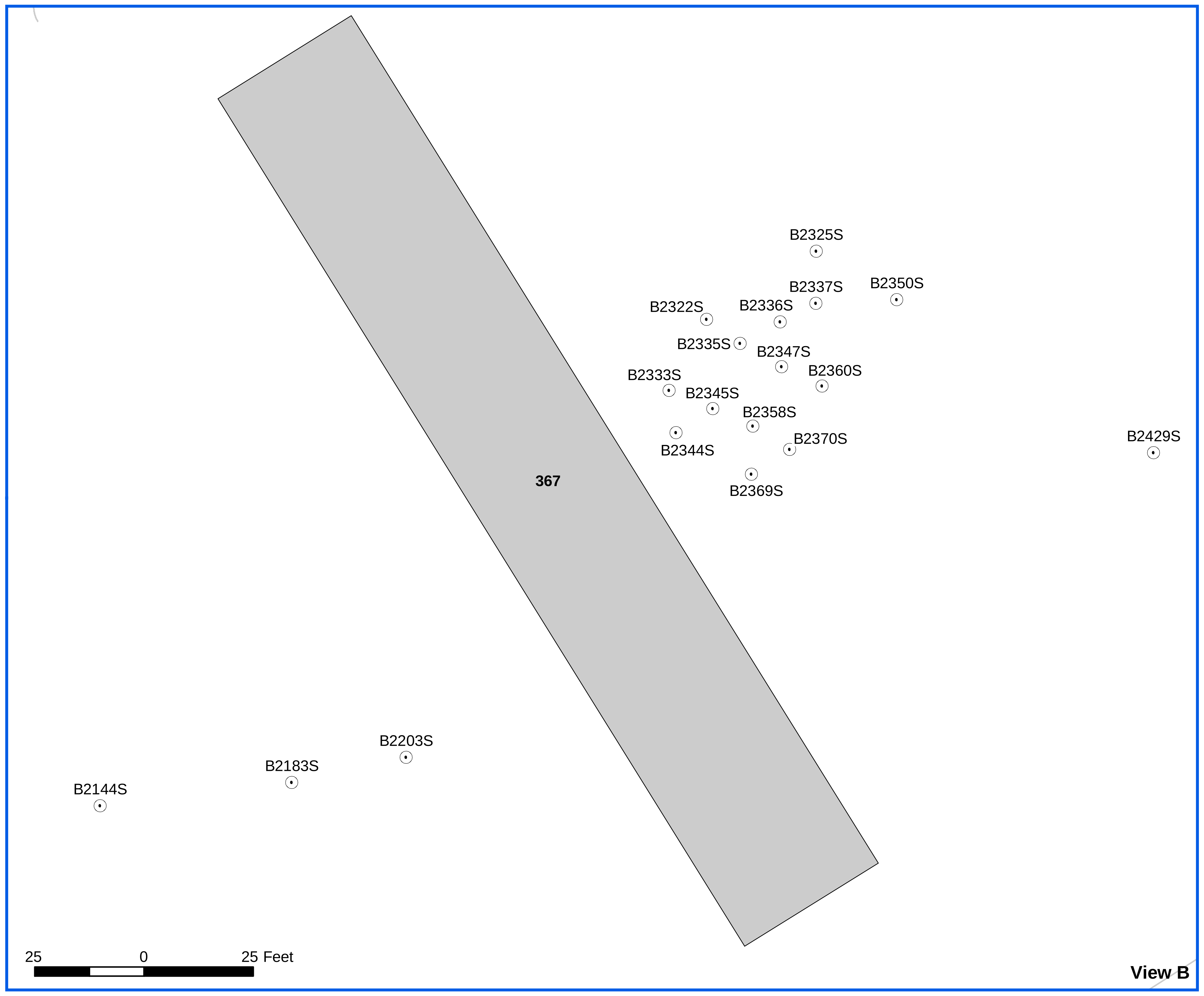
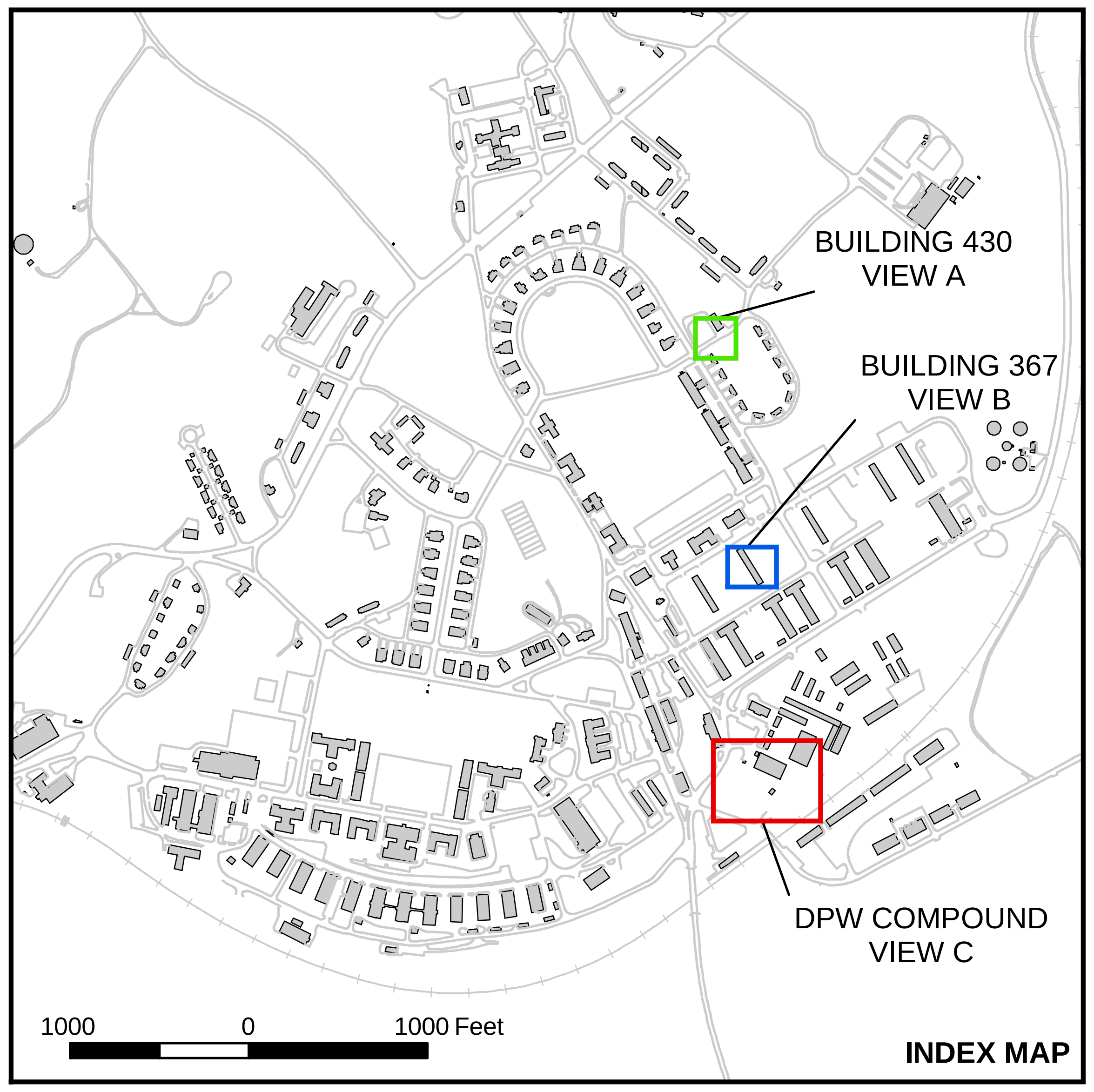
Figure 4-5
SOIL SCREENING LOCATIONS
BUILDING 367
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig4-5soilscreeninglocations.mxd 01/06/03 cjl EL 1:240





LEGEND

- ⊙ Soil Sampling Location
- ═ Roads with Parking Lots
- ▭ Current Buildings
- ▨ Former Building

NORTH

Burns & McDonnell
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Figure 4-6
SOIL SAMPLING LOCATIONS
OFF-SITE ANALYSIS
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/Fig4-6soil_sampling_location.mxd 04/15/03 cjl el

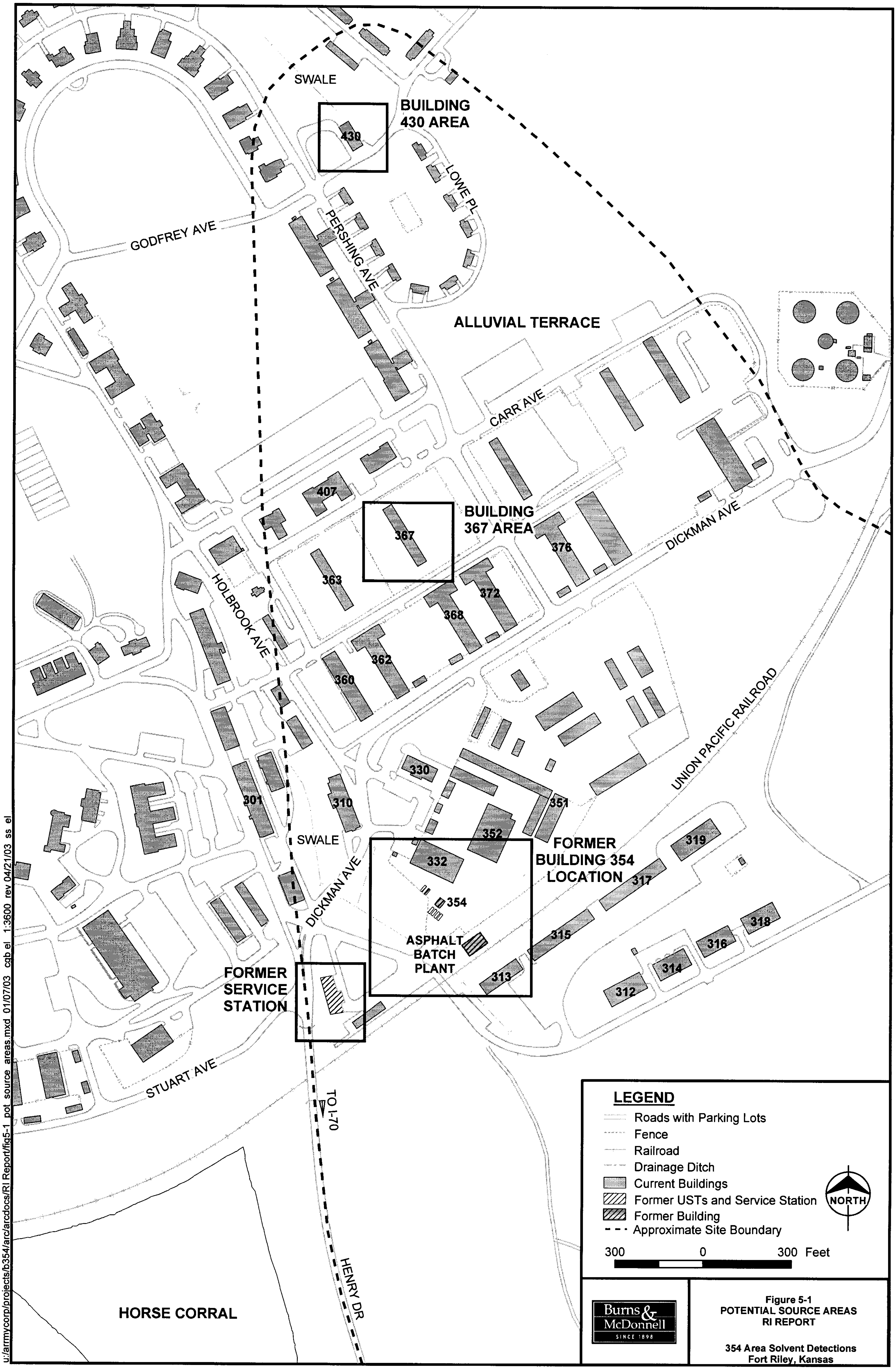
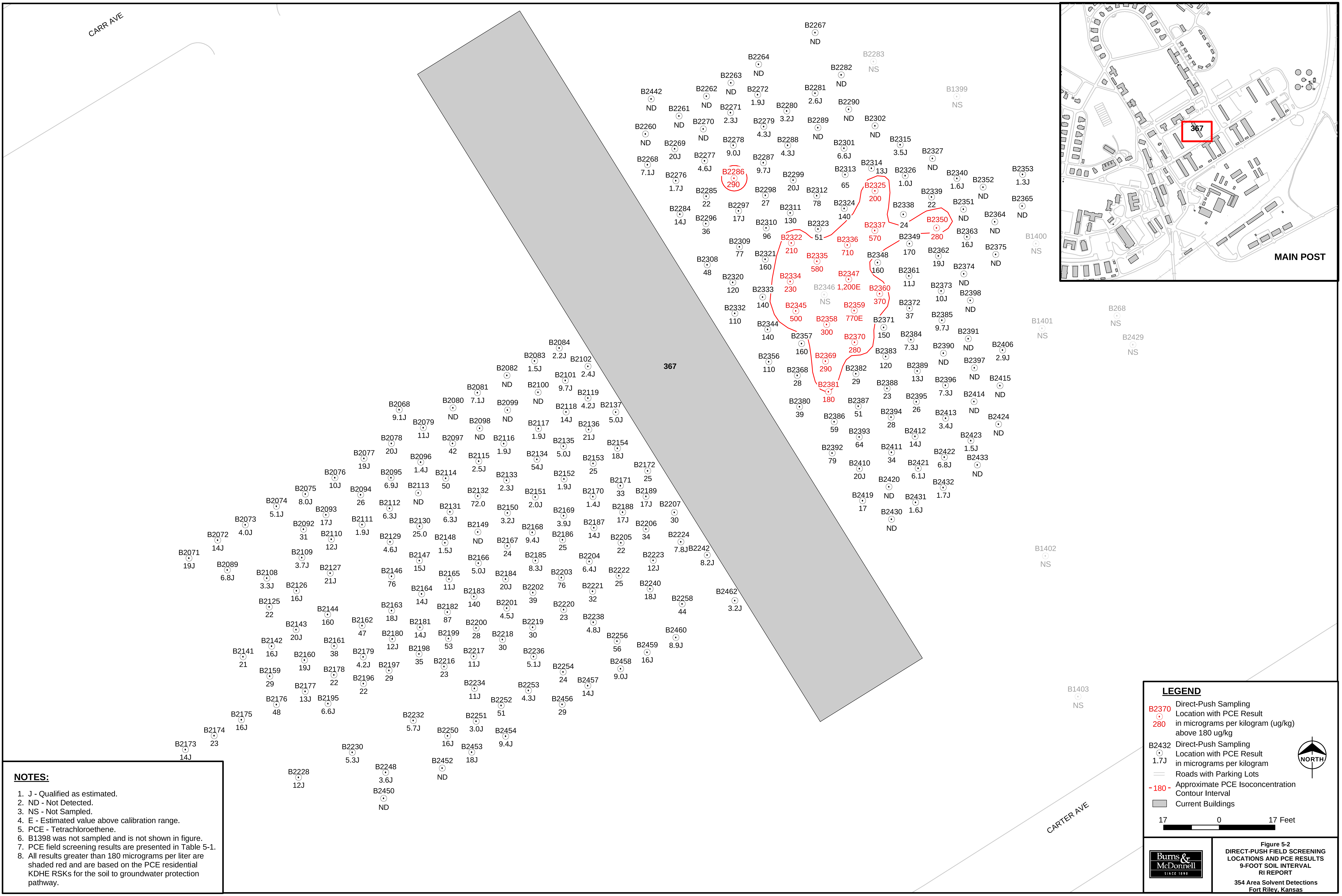


Figure 5-1
POTENTIAL SOURCE AREAS
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig5-1 pot source areas.mxd 01/07/03 cqb el 1:3600 rev 04/21/03 ss el



NOTES:

1. J - Qualified as estimated.
2. ND - Not Detected.
3. NS - Not Sampled.
4. E - Estimated value above calibration range.
5. PCE - Tetrachloroethene.
6. B1398 was not sampled and is not shown in figure.
7. PCE field screening results are presented in Table 5-1.
8. All results greater than 180 micrograms per liter are shaded red and are based on the PCE residential KDHE RSKs for the soil to groundwater protection pathway.

LEGEND

B2370 ⊙ 280	Direct-Push Sampling Location with PCE Result in micrograms per kilogram (ug/kg) above 180 ug/kg
B2432 ⊙ 1.7J	Direct-Push Sampling Location with PCE Result in micrograms per kilogram
═	Roads with Parking Lots
- 180 -	Approximate PCE Isoconcentration Contour Interval
▨	Current Buildings

Figure 5-2
DIRECT-PUSH FIELD SCREENING
LOCATIONS AND PCE RESULTS
9-FOOT SOIL INTERVAL
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/rireport/fig5-2_9ftpce_sumfall2001.mxd 01/06/03 cgb el 1:204

NOTES:

1. J - Qualified as estimated.
2. ND - Not Detected.
3. NS - Not Sampled.
4. PCE - Tetrachloroethene.
5. B1398 was not sampled and is not shown in figure.
6. PCE field screening results are presented in Table 5-1.
7. All results greater than 180 micrograms per liter are shaded red and are based on the PCE residential KDHE RSKs for the soil to groundwater protection pathway.

LEGEND

B2337 ⊙ 610	Direct-Push Sampling Location with PCE Result in micrograms per kilogram (ug/kg) above 180 ug/kg
B2392 ⊙ 1.8J	Direct-Push Sampling Location with PCE Result in micrograms per kilogram
═	Roads with Parking Lots
-180-	Approximate PCE Isoconcentration Contour Interval
▨	Current Buildings

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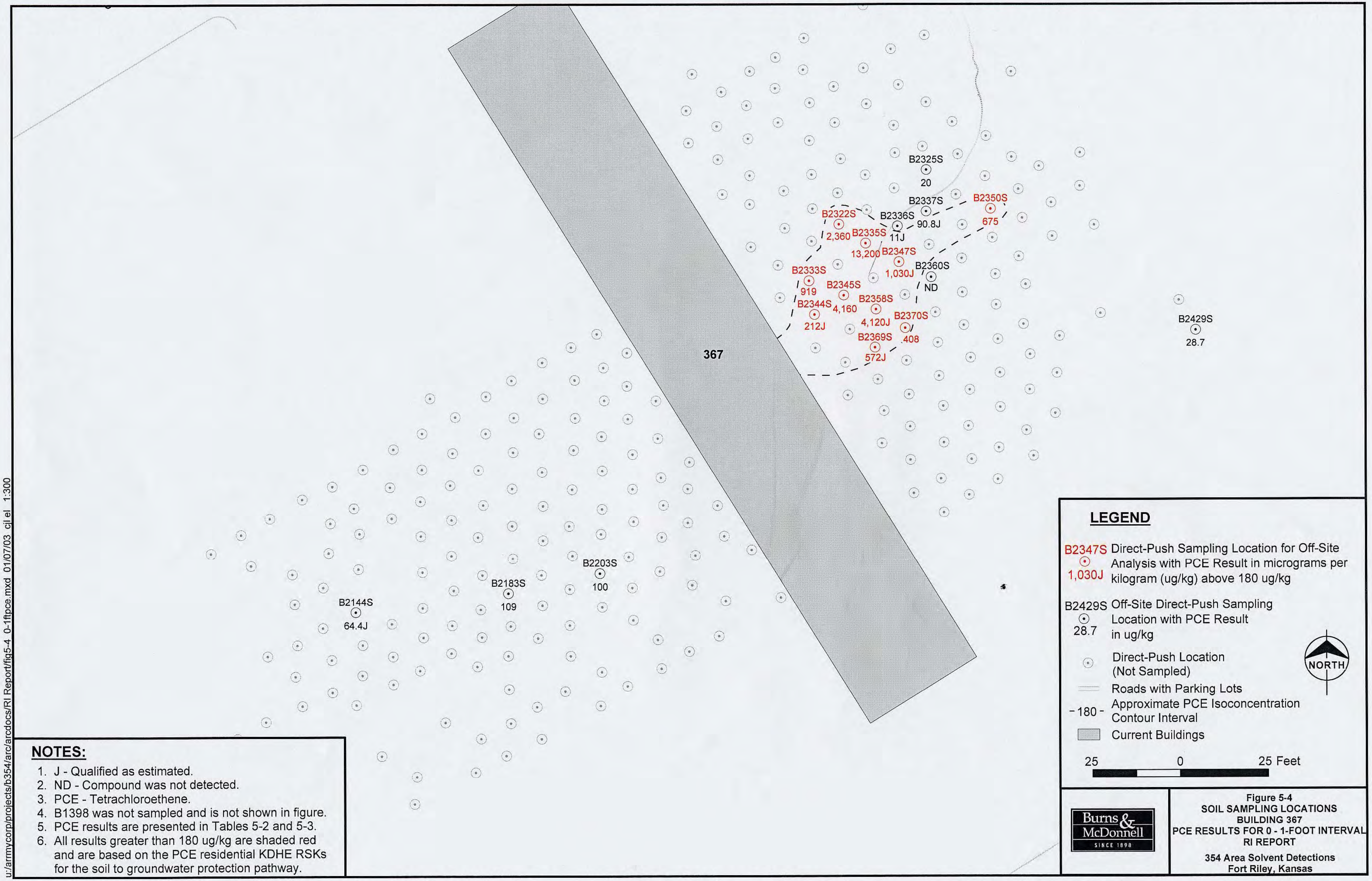
SINCE 1898

Figure 5-3
DIRECT-PUSH FIELD SCREENING
LOCATIONS AND PCE RESULTS
15-FOOT SOIL INTERVAL
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/rireport/fig5-3_15ftpce_sumfall2001.mxd 01/06/03 cgb el 1:204



LEGEND

B2347S ⊙ 1,030J Direct-Push Sampling Location for Off-Site Analysis with PCE Result in micrograms per kilogram (ug/kg) above 180 ug/kg

B2429S ⊙ 28.7 Off-Site Direct-Push Sampling Location with PCE Result in ug/kg

⊙ Direct-Push Location (Not Sampled)

Roads with Parking Lots

- 180 - Approximate PCE Isoconcentration Contour Interval

▨ Current Buildings

NOTES:

1. J - Qualified as estimated.
2. ND - Compound was not detected.
3. PCE - Tetrachloroethene.
4. B1398 was not sampled and is not shown in figure.
5. PCE results are presented in Tables 5-2 and 5-3.
6. All results greater than 180 ug/kg are shaded red and are based on the PCE residential KDHE RSKs for the soil to groundwater protection pathway.

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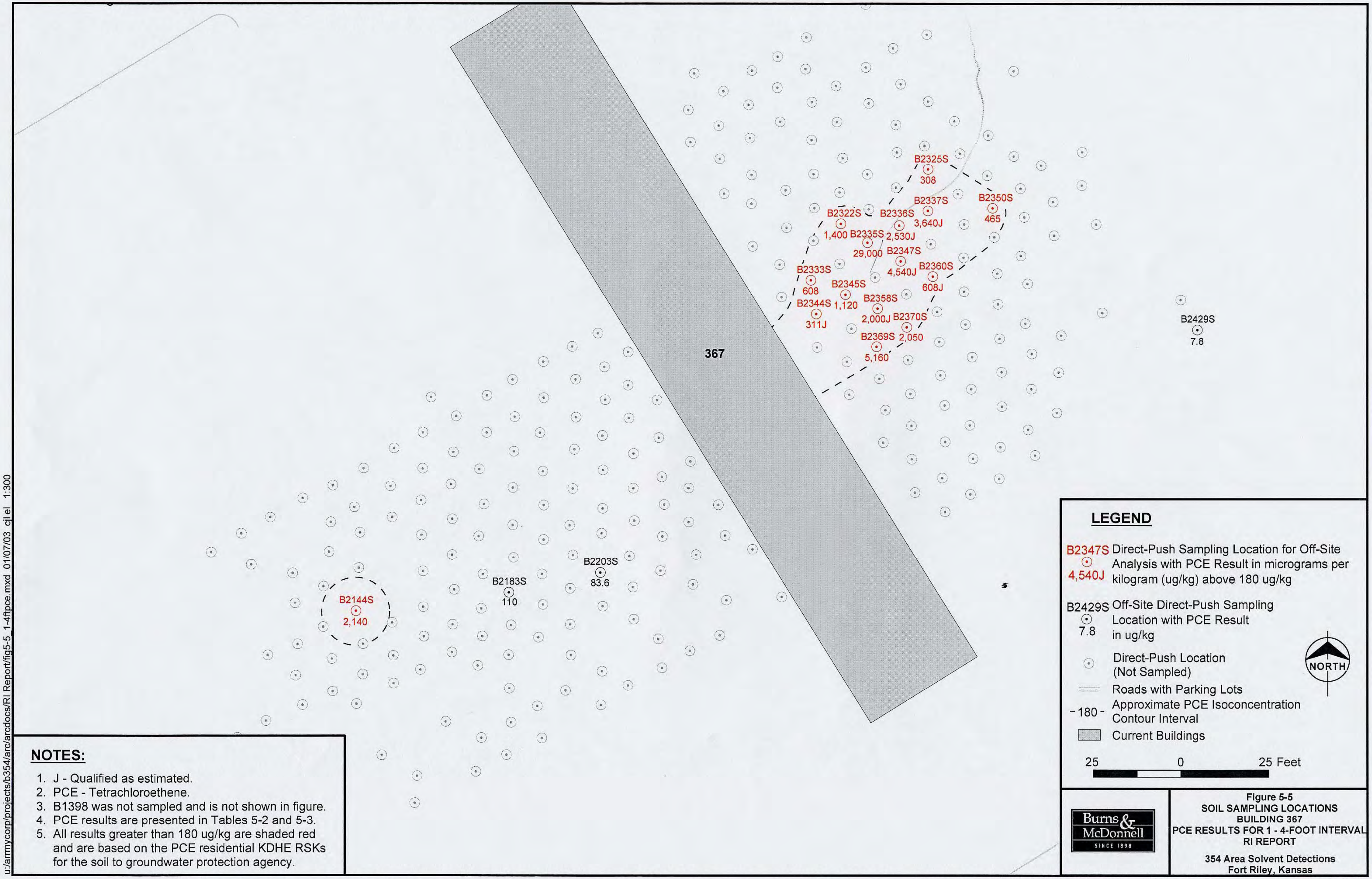
Figure 5-4
SOIL SAMPLING LOCATIONS
BUILDING 367
PCE RESULTS FOR 0 - 1-FOOT INTERVAL
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig5-4 0-1ftpce.mxd 01/07/03 cjl el 1:300



NOTES:

1. J - Qualified as estimated.
2. PCE - Tetrachloroethene.
3. B1398 was not sampled and is not shown in figure.
4. PCE results are presented in Tables 5-2 and 5-3.
5. All results greater than 180 ug/kg are shaded red and are based on the PCE residential KDHE RSKs for the soil to groundwater protection agency.

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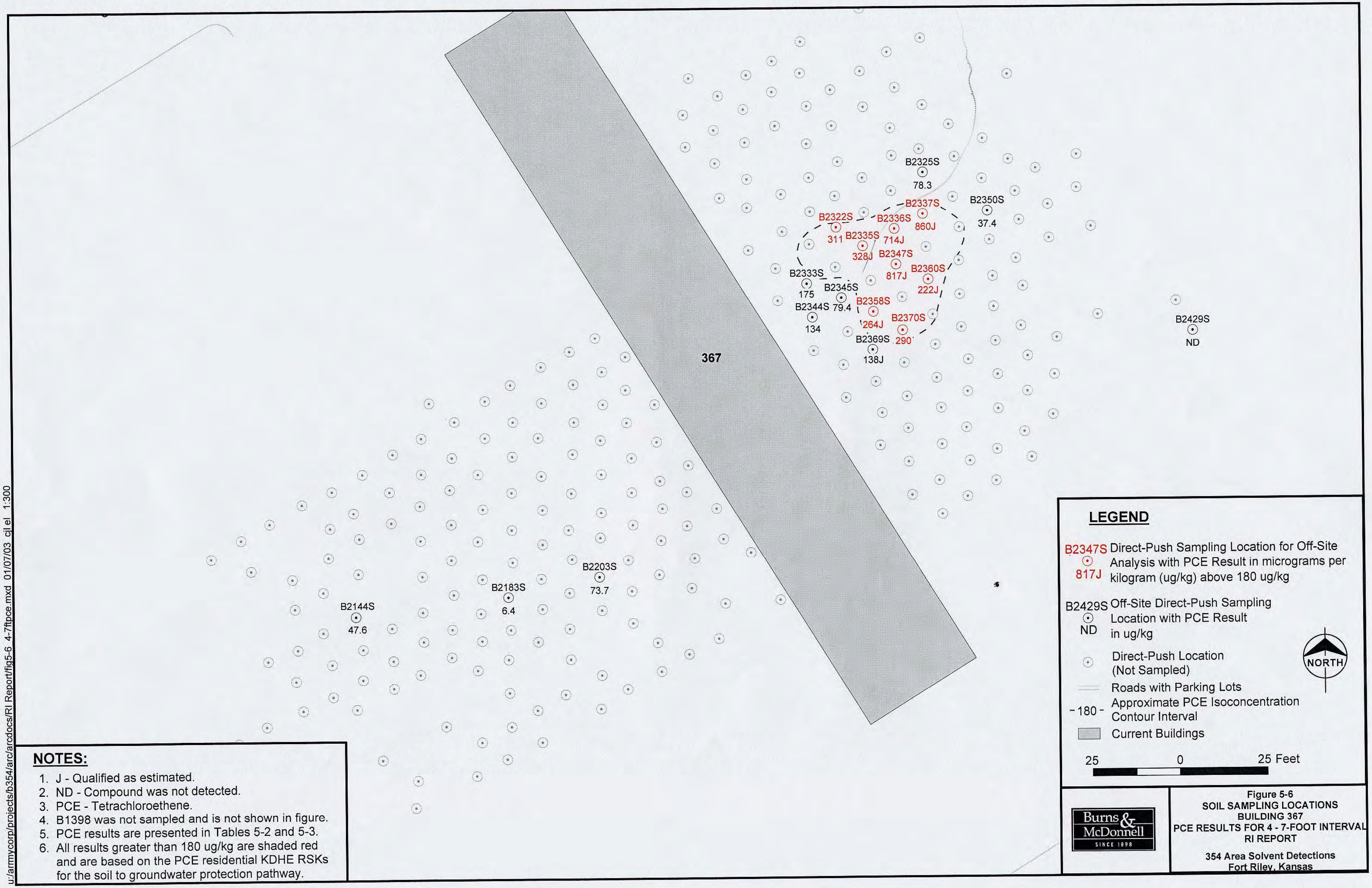
Figure 5-5
SOIL SAMPLING LOCATIONS
BUILDING 367
PCE RESULTS FOR 1 - 4-FOOT INTERVAL
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig5-5_1-4ftpce.mxd 01/07/03 cjl el 1:300



LEGEND

B2347S ⊙ 817J Direct-Push Sampling Location for Off-Site Analysis with PCE Result in micrograms per kilogram (ug/kg) above 180 ug/kg

B2429S ⊙ ND Off-Site Direct-Push Sampling Location with PCE Result in ug/kg

⊙ Direct-Push Location (Not Sampled)

Roads with Parking Lots

- 180 - Approximate PCE Isoconcentration Contour Interval

▨ Current Buildings

25 0 25 Feet

NOTES:

1. J - Qualified as estimated.
2. ND - Compound was not detected.
3. PCE - Tetrachloroethene.
4. B1398 was not sampled and is not shown in figure.
5. PCE results are presented in Tables 5-2 and 5-3.
6. All results greater than 180 ug/kg are shaded red and are based on the PCE residential KDHE RSKs for the soil to groundwater protection pathway.

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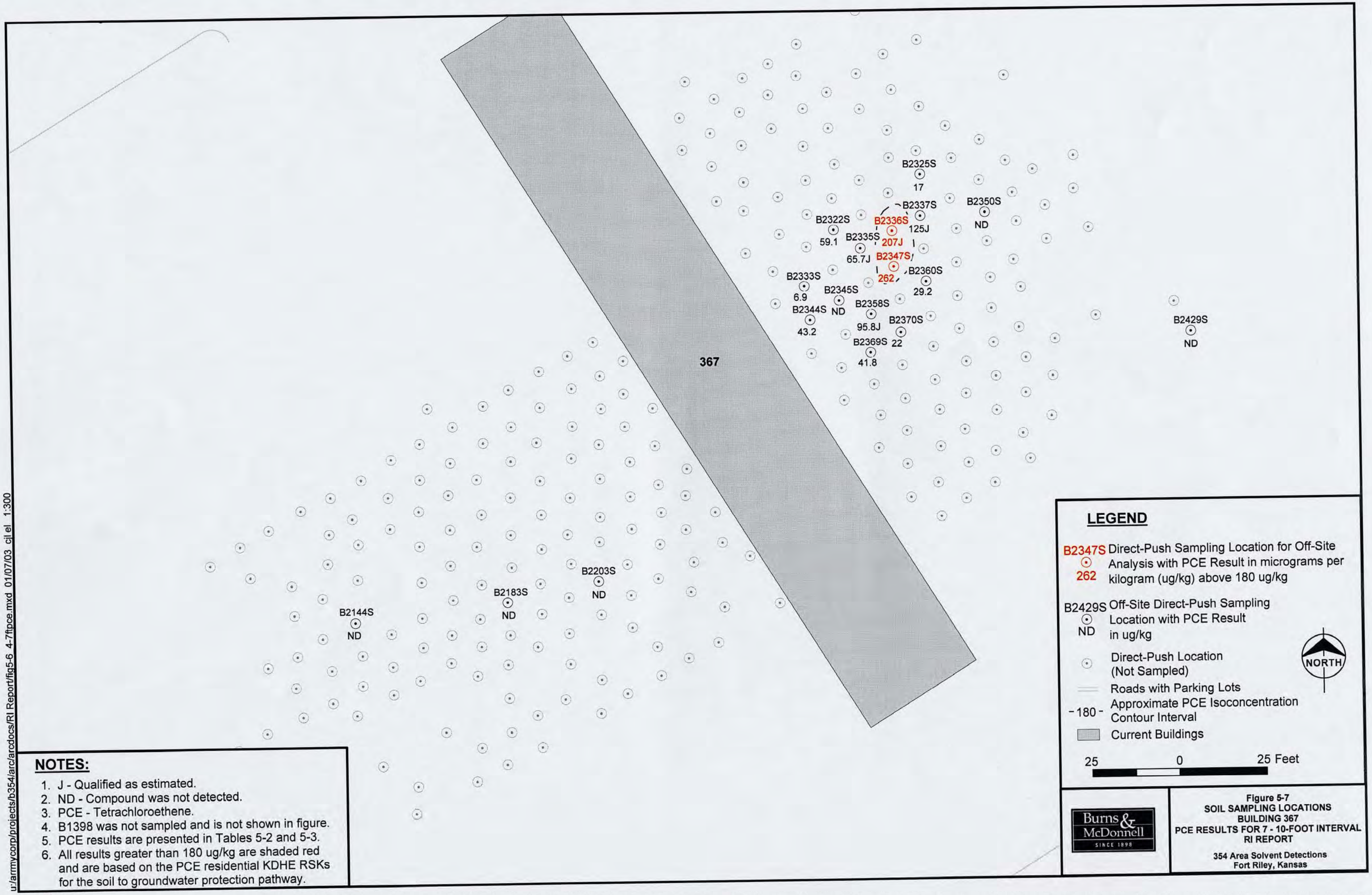
Figure 5-6
SOIL SAMPLING LOCATIONS
BUILDING 367
PCE RESULTS FOR 4 - 7-FOOT INTERVAL
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig5-6 4-7ftpce.mxd 01/07/03 cjl el 1:300



LEGEND

B2347S ⊙ 262 Direct-Push Sampling Location for Off-Site Analysis with PCE Result in micrograms per kilogram (ug/kg) above 180 ug/kg

B2429S ⊙ ND Off-Site Direct-Push Sampling Location with PCE Result in ug/kg

⊙ Direct-Push Location (Not Sampled)

═ Roads with Parking Lots

- 180 - Approximate PCE Isoconcentration Contour Interval

▨ Current Buildings

NOTES:

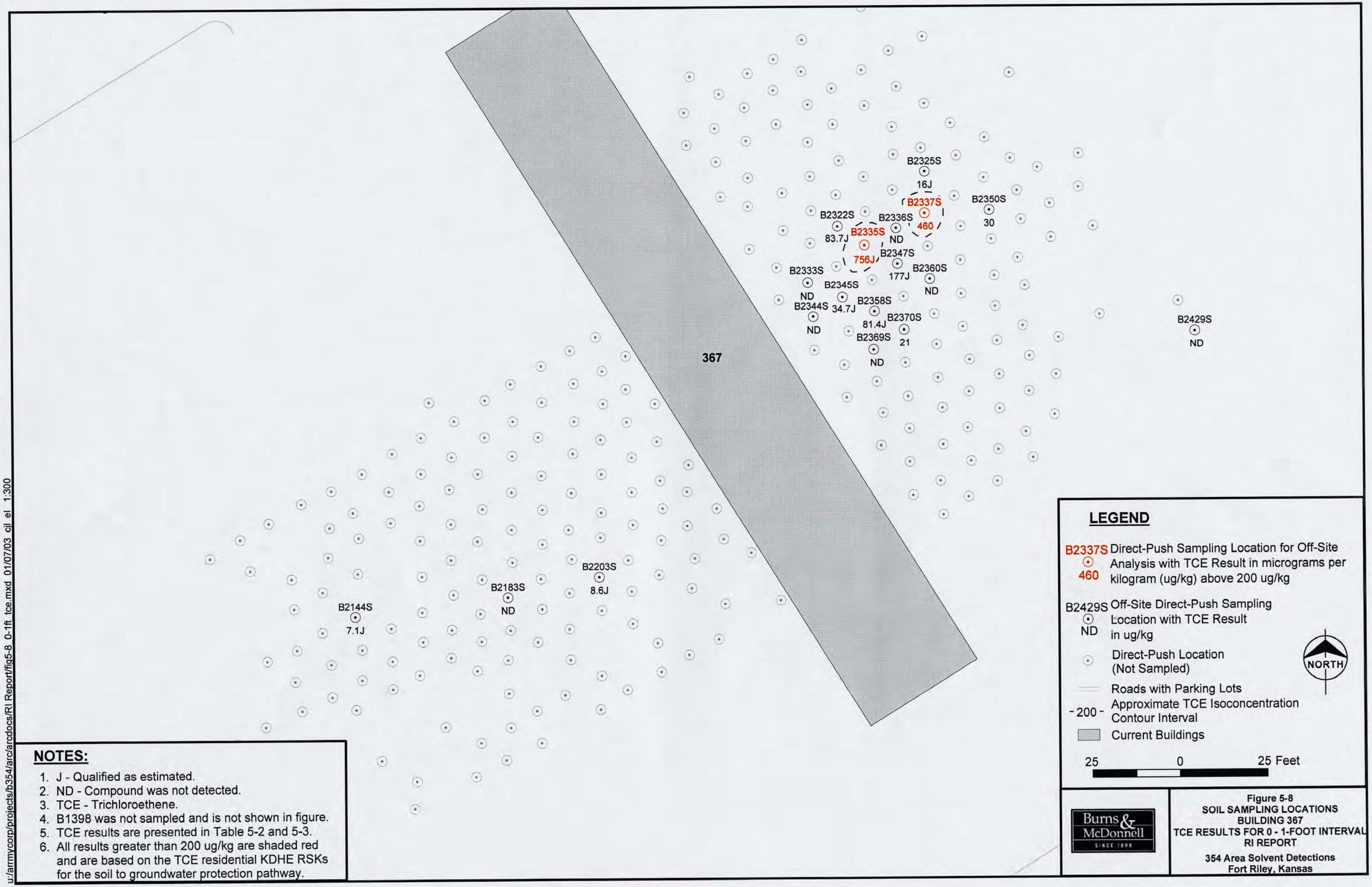
1. J - Qualified as estimated.
2. ND - Compound was not detected.
3. PCE - Tetrachloroethene.
4. B1398 was not sampled and is not shown in figure.
5. PCE results are presented in Tables 5-2 and 5-3.
6. All results greater than 180 ug/kg are shaded red and are based on the PCE residential KDHE RSKs for the soil to groundwater protection pathway.

Burns & McDonnell
SINCE 1898

Figure 5-7
SOIL SAMPLING LOCATIONS
BUILDING 367
PCE RESULTS FOR 7 - 10-FOOT INTERVAL
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig5-6 4-7ftpce.mxd 01/07/03 cjl el 1:300



LEGEND

B2337S ⊙ 460 Direct-Push Sampling Location for Off-Site Analysis with TCE Result in micrograms per kilogram (ug/kg) above 200 ug/kg

B2429S ⊙ ND Off-Site Direct-Push Sampling Location with TCE Result in ug/kg

⊙ Direct-Push Location (Not Sampled)

Roads with Parking Lots

- 200 - Approximate TCE Isoconcentration Contour Interval

▨ Current Buildings

25 0 25 Feet

NOTES:

1. J - Qualified as estimated.
2. ND - Compound was not detected.
3. TCE - Trichloroethene.
4. B1398 was not sampled and is not shown in figure.
5. TCE results are presented in Table 5-2 and 5-3.
6. All results greater than 200 ug/kg are shaded red and are based on the TCE residential KDHE RSKs for the soil to groundwater protection pathway.

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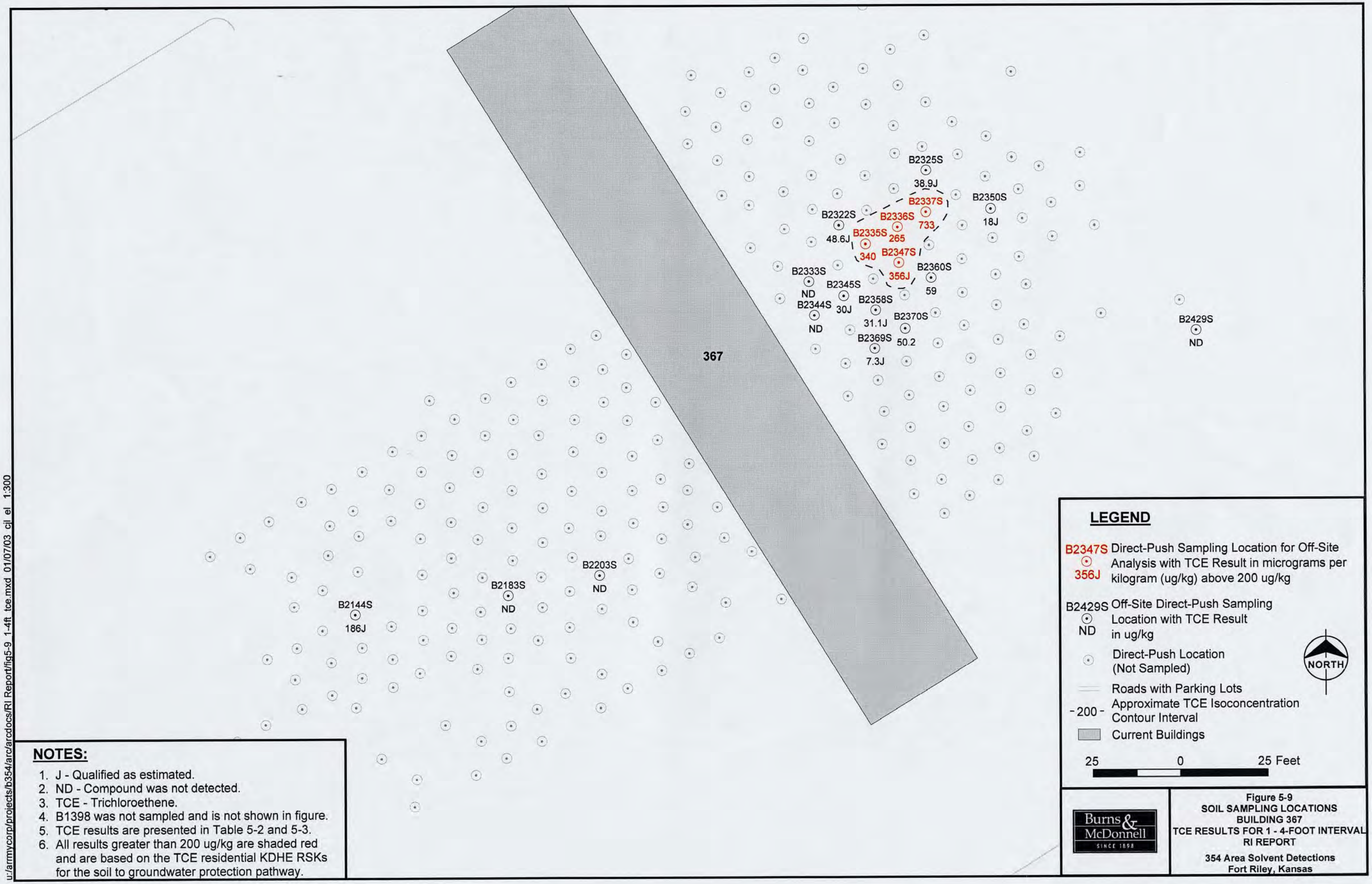
SINCE 1898

Figure 5-8
SOIL SAMPLING LOCATIONS
BUILDING 367
TCE RESULTS FOR 0 - 1-FOOT INTERVAL
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig5-8_0-1ft_tce.mxd 01/07/03 cjl el 1:300



LEGEND

B2347S ⊙ 356J	Direct-Push Sampling Location for Off-Site Analysis with TCE Result in micrograms per kilogram (ug/kg) above 200 ug/kg
B2429S ⊙ ND	Off-Site Direct-Push Sampling Location with TCE Result in ug/kg
⊙	Direct-Push Location (Not Sampled)
	Roads with Parking Lots
- 200 -	Approximate TCE Isoconcentration Contour Interval
▨	Current Buildings

25 0 25 Feet

NOTES:

1. J - Qualified as estimated.
2. ND - Compound was not detected.
3. TCE - Trichloroethene.
4. B1398 was not sampled and is not shown in figure.
5. TCE results are presented in Table 5-2 and 5-3.
6. All results greater than 200 ug/kg are shaded red and are based on the TCE residential KDHE RSKs for the soil to groundwater protection pathway.

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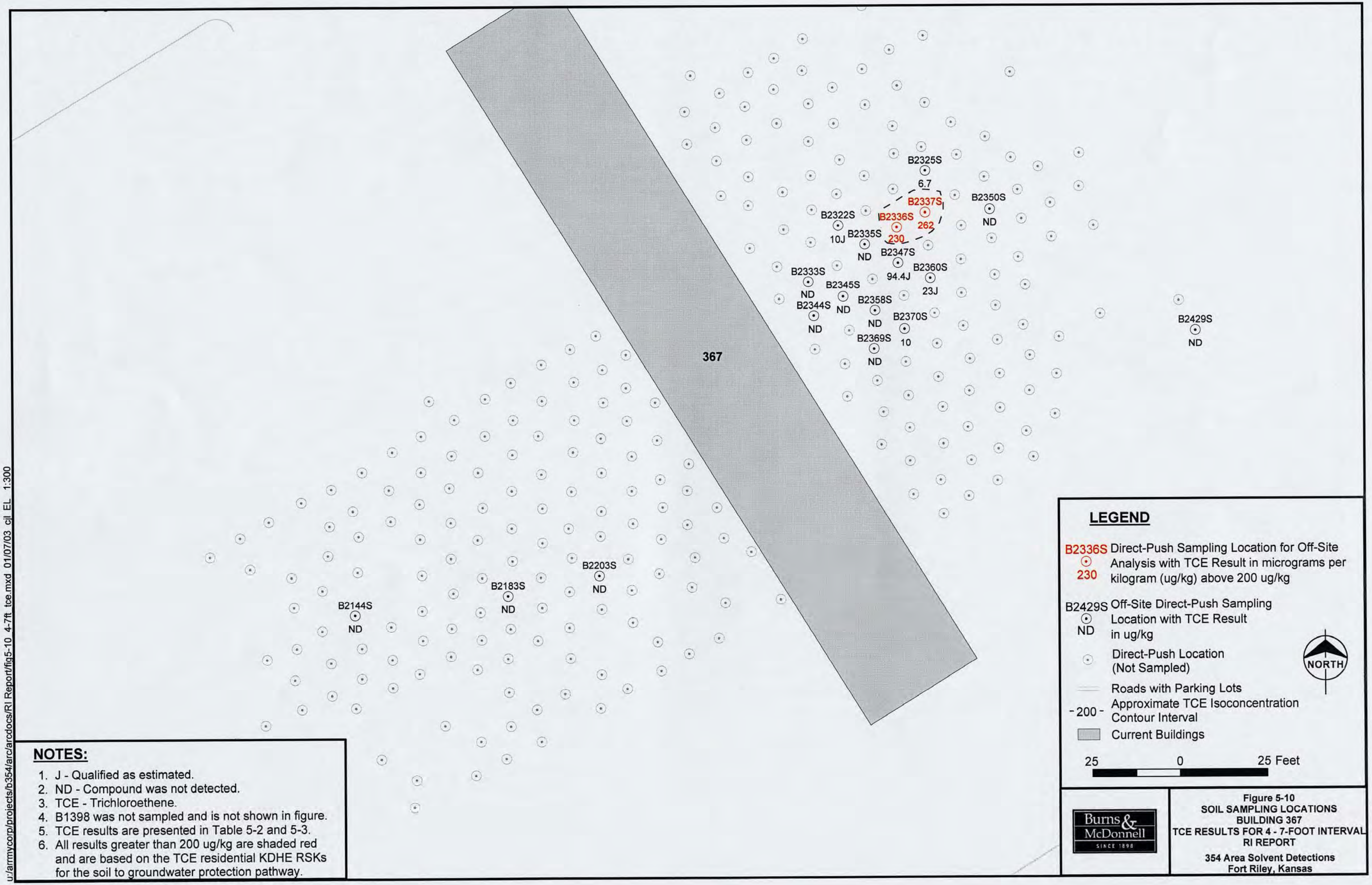
Figure 5-9
SOIL SAMPLING LOCATIONS
BUILDING 367
TCE RESULTS FOR 1 - 4-FOOT INTERVAL
RI REPORT
354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig5-9 1-4ft tce.mxd 01/07/03 cjl el 1:300



LEGEND

B2336S ⊙ 230	Direct-Push Sampling Location for Off-Site Analysis with TCE Result in micrograms per kilogram (ug/kg) above 200 ug/kg
B2429S ⊙ ND	Off-Site Direct-Push Sampling Location with TCE Result in ug/kg
⊙	Direct-Push Location (Not Sampled)
	Roads with Parking Lots
- 200 -	Approximate TCE Isoconcentration Contour Interval
▨	Current Buildings

NOTES:

1. J - Qualified as estimated.
2. ND - Compound was not detected.
3. TCE - Trichloroethene.
4. B1398 was not sampled and is not shown in figure.
5. TCE results are presented in Table 5-2 and 5-3.
6. All results greater than 200 ug/kg are shaded red and are based on the TCE residential KDHE RSKs for the soil to groundwater protection pathway.

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Figure 5-10
SOIL SAMPLING LOCATIONS
BUILDING 367
TCE RESULTS FOR 4 - 7-FOOT INTERVAL
RI REPORT

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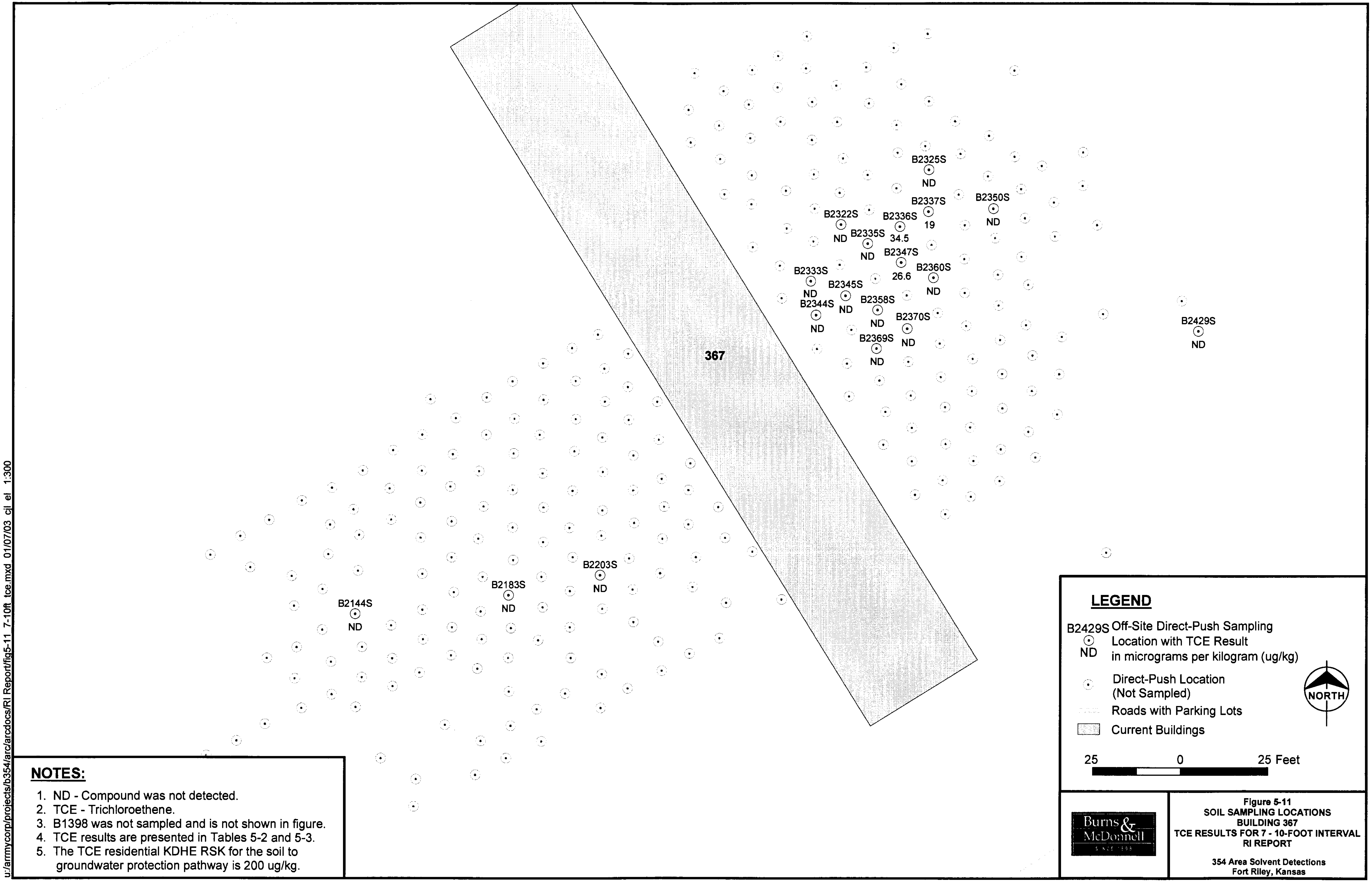
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig5-10_4-7ft_tce.mxd 01/07/03 cjl EL 1:300



LEGEND

B2429S ⊙ ND Off-Site Direct-Push Sampling Location with TCE Result in micrograms per kilogram (ug/kg)

⊙ Direct-Push Location (Not Sampled)

Roads with Parking Lots

▨ Current Buildings

NOTES:

1. ND - Compound was not detected.
2. TCE - Trichloroethene.
3. B1398 was not sampled and is not shown in figure.
4. TCE results are presented in Tables 5-2 and 5-3.
5. The TCE residential KDHE RSK for the soil to groundwater protection pathway is 200 ug/kg.

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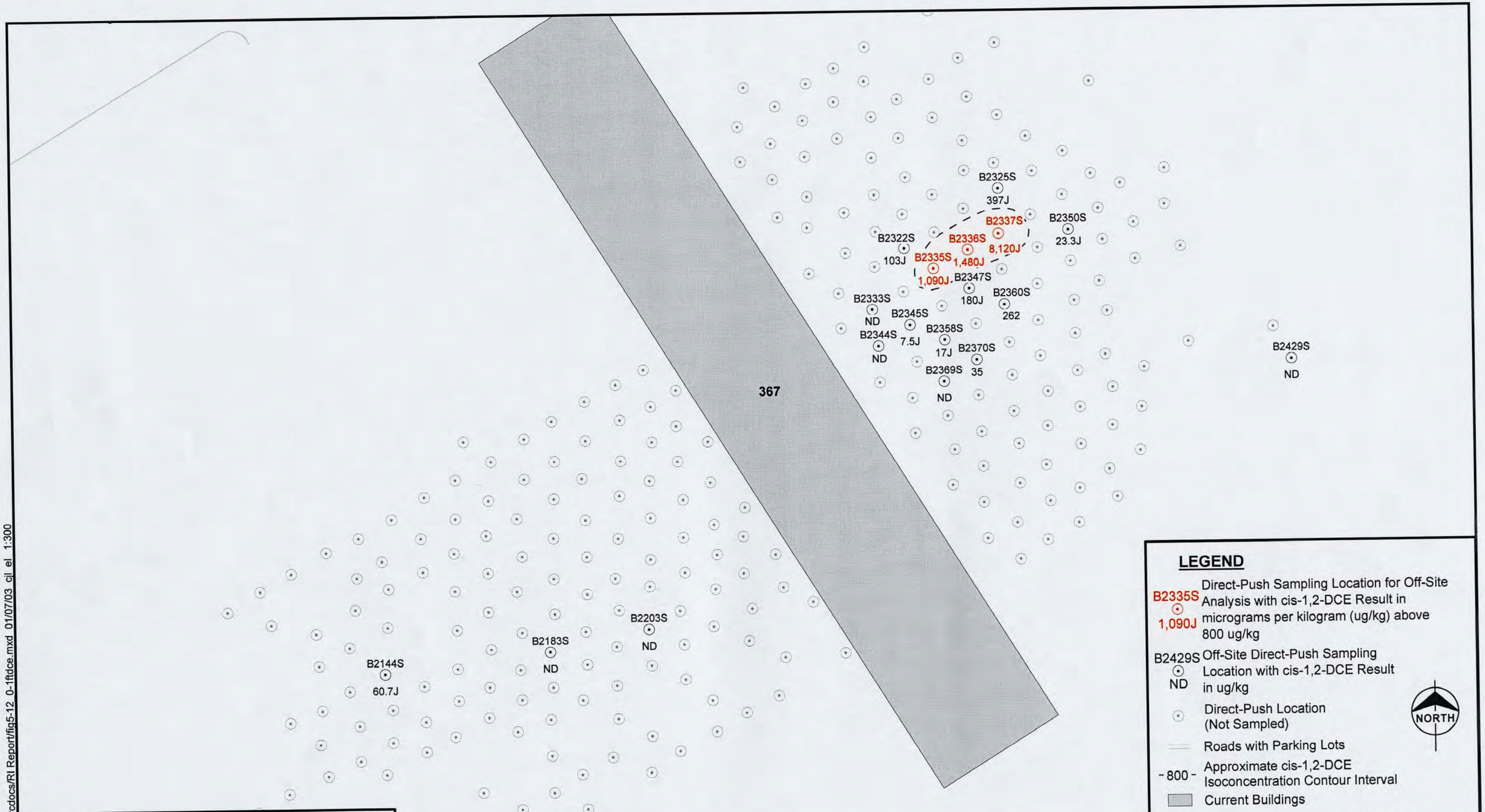
Figure 5-11
SOIL SAMPLING LOCATIONS
BUILDING 367
TCE RESULTS FOR 7 - 10-FOOT INTERVAL
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig5-11 7-10ft tce.mxd 01/07/03 cjl el 1:300



LEGEND

B2335S ⊙ 1,090J Direct-Push Sampling Location for Off-Site Analysis with cis-1,2-DCE Result in micrograms per kilogram (ug/kg) above 800 ug/kg

B2429S ⊙ ND Off-Site Direct-Push Sampling Location with cis-1,2-DCE Result in ug/kg

⊙ Direct-Push Location (Not Sampled)

— Roads with Parking Lots

- 800 - Approximate cis-1,2-DCE Isoconcentration Contour Interval

▨ Current Buildings

25 0 25 Feet

NORTH

NOTES:

1. J - Qualified as estimated.
2. ND - Compound was not detected.
3. DCE - Dichloroethene.
4. B1398 was not sampled and is not shown in figure.
5. cis-1,2-DCE results are presented in Table 5-2 and 5-3.
6. All results greater than 800 ug/kg are shaded red and are based on the cis-1,2-DCE residential KDHE RSKs for the soil to groundwater protection pathway.

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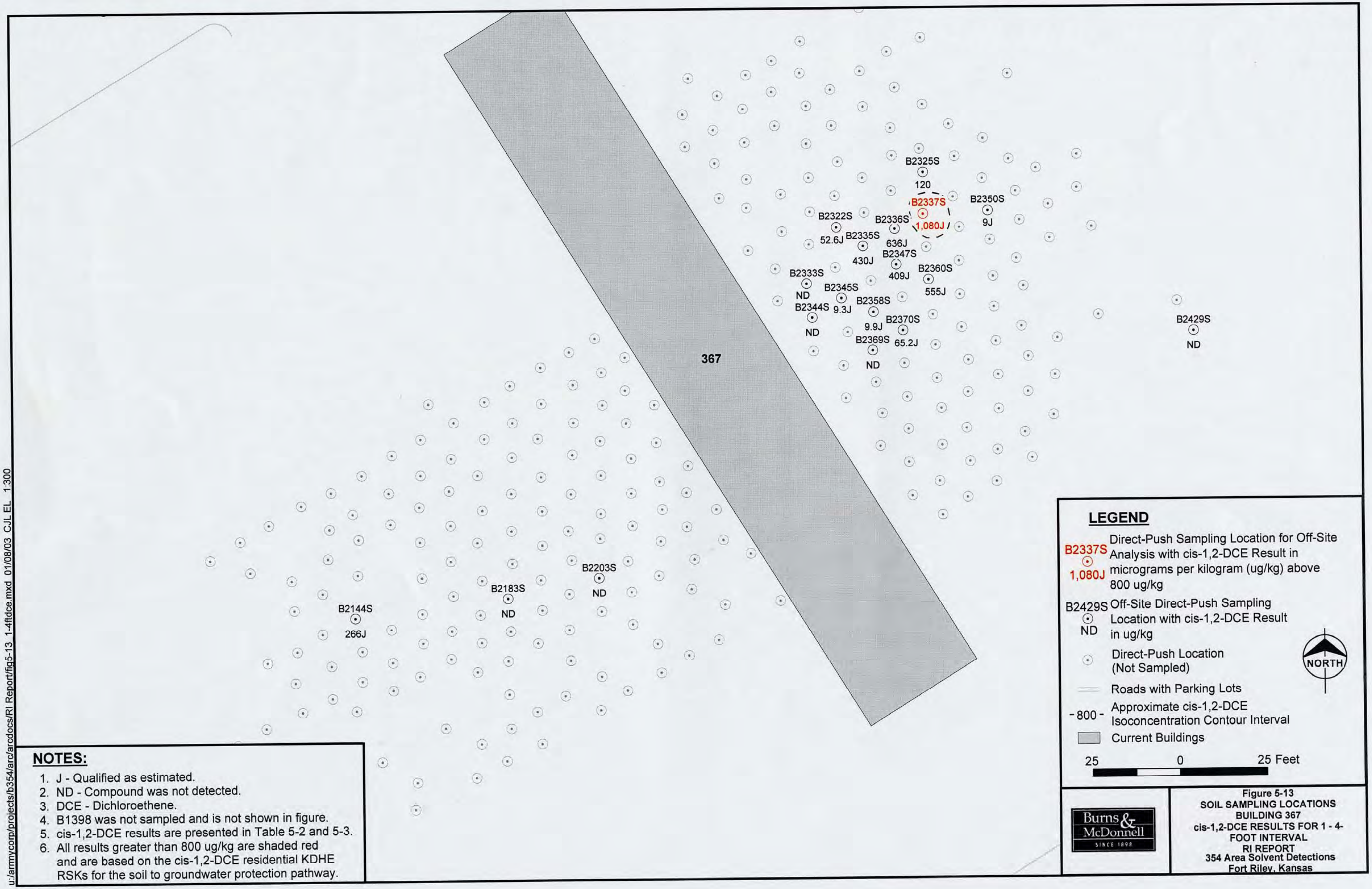
Figure 5-12
SOIL SAMPLING LOCATIONS
BUILDING 367
cis-1,2-DCE RESULTS FOR 0 - 1-FOOT INTERVAL
RI REPORT
354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig5-12 0-1ftdce.mxd 01/07/03 cjl el 1:300



NOTES:

1. J - Qualified as estimated.
2. ND - Compound was not detected.
3. DCE - Dichloroethene.
4. B1398 was not sampled and is not shown in figure.
5. cis-1,2-DCE results are presented in Table 5-2 and 5-3.
6. All results greater than 800 ug/kg are shaded red and are based on the cis-1,2-DCE residential KDHE RSKs for the soil to groundwater protection pathway.

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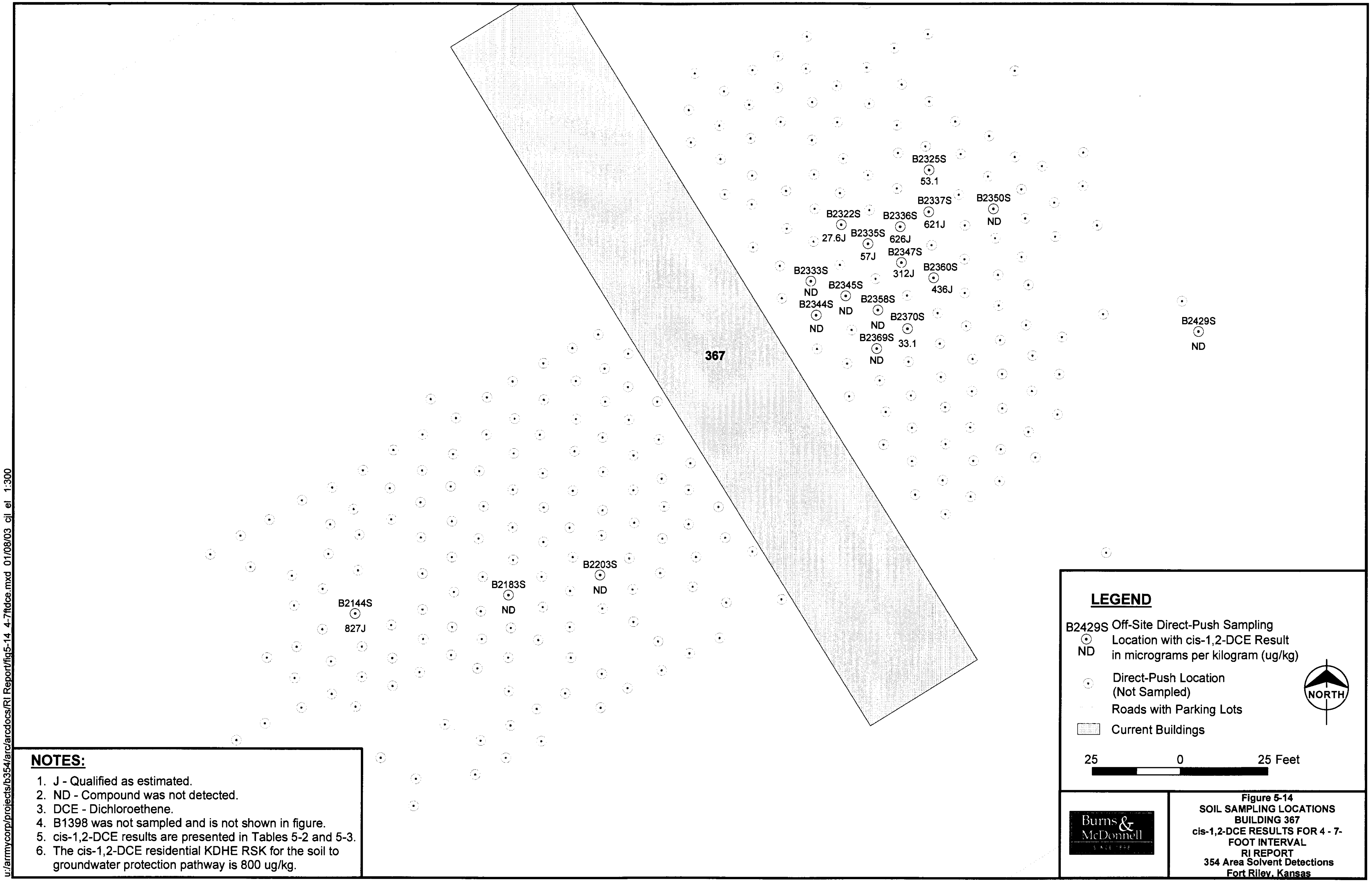
Figure 5-13
SOIL SAMPLING LOCATIONS
BUILDING 367
cis-1,2-DCE RESULTS FOR 1 - 4-FOOT INTERVAL
RI REPORT
354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig5-13 1-4ftdce.mxd 01/08/03 CJL EL 1:300



LEGEND

B2429S ⊙ ND Off-Site Direct-Push Sampling Location with cis-1,2-DCE Result in micrograms per kilogram (ug/kg)

⊙ Direct-Push Location (Not Sampled)

Roads with Parking Lots

▨ Current Buildings

NOTES:

1. J - Qualified as estimated.
2. ND - Compound was not detected.
3. DCE - Dichloroethene.
4. B1398 was not sampled and is not shown in figure.
5. cis-1,2-DCE results are presented in Tables 5-2 and 5-3.
6. The cis-1,2-DCE residential KDHE RSK for the soil to groundwater protection pathway is 800 ug/kg.

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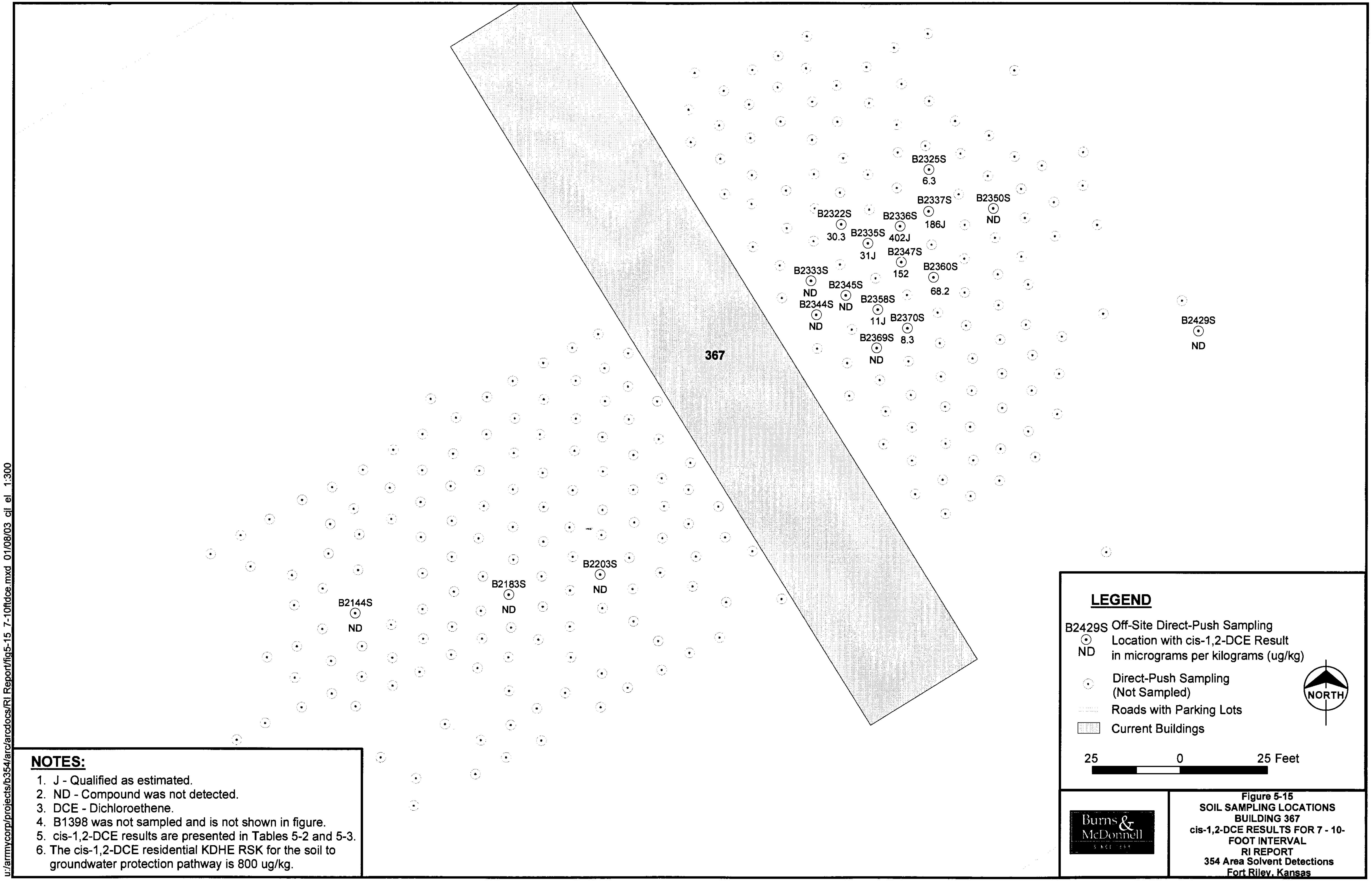
Figure 5-14
SOIL SAMPLING LOCATIONS
BUILDING 367
cis-1,2-DCE RESULTS FOR 4 - 7-FOOT INTERVAL
RI REPORT
354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig5-14 4-7ftdce.mxd 01/08/03 cjl el 1:300



LEGEND

B2429S ⊙ ND Off-Site Direct-Push Sampling Location with cis-1,2-DCE Result in micrograms per kilograms (ug/kg)

⊙ Direct-Push Sampling (Not Sampled)

Roads with Parking Lots

▨ Current Buildings

25 0 25 Feet

NORTH

NOTES:

1. J - Qualified as estimated.
2. ND - Compound was not detected.
3. DCE - Dichloroethene.
4. B1398 was not sampled and is not shown in figure.
5. cis-1,2-DCE results are presented in Tables 5-2 and 5-3.
6. The cis-1,2-DCE residential KDHE RSK for the soil to groundwater protection pathway is 800 ug/kg.

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Figure 5-15
SOIL SAMPLING LOCATIONS
BUILDING 367
cis-1,2-DCE RESULTS FOR 7 - 10-FOOT INTERVAL
RI REPORT
354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig5-15 7-10ftdce.mxd 01/08/03 cjl el 1:300

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig5-16_soilgas_cartet_9ft.mxd 1/06/03 cjl el 1:240

NOTES:

1. J - Qualified as estimated.
2. ND - Compound was not detected.
3. Carbon Tetrachloride soil-gas results are presented in Table 5-6.
4. 10 ug/L isoconcentration contour selection arbitrary.
5. Results are from on-site analysis.
6. Sampling locations B892, B1079, B1087, B1136 and B10631 are located approximately. These locations were not recovered during survey.

LEGEND

⊙	Direct-Push Soil-Gas Sampling Location
·	Direct-Push Location (Not Sampled)
·10·	Carbon Tetrachloride Isoconcentration Contour (10 micrograms per liter)
═	Roads with Parking Lots
-◎-	Sewerline with Manhole
▨	Current Buildings

20 0 20 Feet

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Figure 5-16
SOIL-GAS SAMPLING LOCATIONS
BUILDING 430
CARBON TETRACHLORIDE RESULTS
9-FOOT DEPTH
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

LEGEND

- ⊙ Direct-Push Soil-Gas Sampling Location
- ⊙ Direct-Push Location (Not Sampled)
- Roads with Parking Lots
- Sewerline with Manhole
- ▨ Current Buildings

NOTES:

1. J - Qualified as estimated.
2. ND - Compound was not detected.
3. Carbon Tetrachloride soil-gas results are presented in Table 5-6.
4. Results are from on-site analysis.
5. Sampling locations B892, B1079, B1087, B1136 and B10631 are located approximately. These locations were not recovered during survey.

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Figure 5-17
SOIL-GAS SAMPLING LOCATIONS
BUILDING 430
CARBON TETRACHLORIDE RESULTS
15-FOOT DEPTH
RI REPORT
354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/RI Report/fig5-17_soilgas_cartet_9ft.mxd 1/06/03 CJL EL 1:240

LEGEND

B1000 ⊙ Direct-Push Soil-Gas Sampling Location
ND 9ft Sample Result
ND 15ft Sample Result
⊙ Direct-Push Location (Not Sampled)
═ Roads with Parking Lots
▨ Current Buildings

NOTES:

1. J - Qualified as estimated.
2. ND - Compound was not detected.
3. TCE - Trichloroethene.
4. TCE soil-gas results are presented in Table 5-6.
5. Results are from on-site analysis.
6. Sampling locations B892, B1079, B1087, B1136 and B10631 are located approximately. These locations were not recovered during survey.

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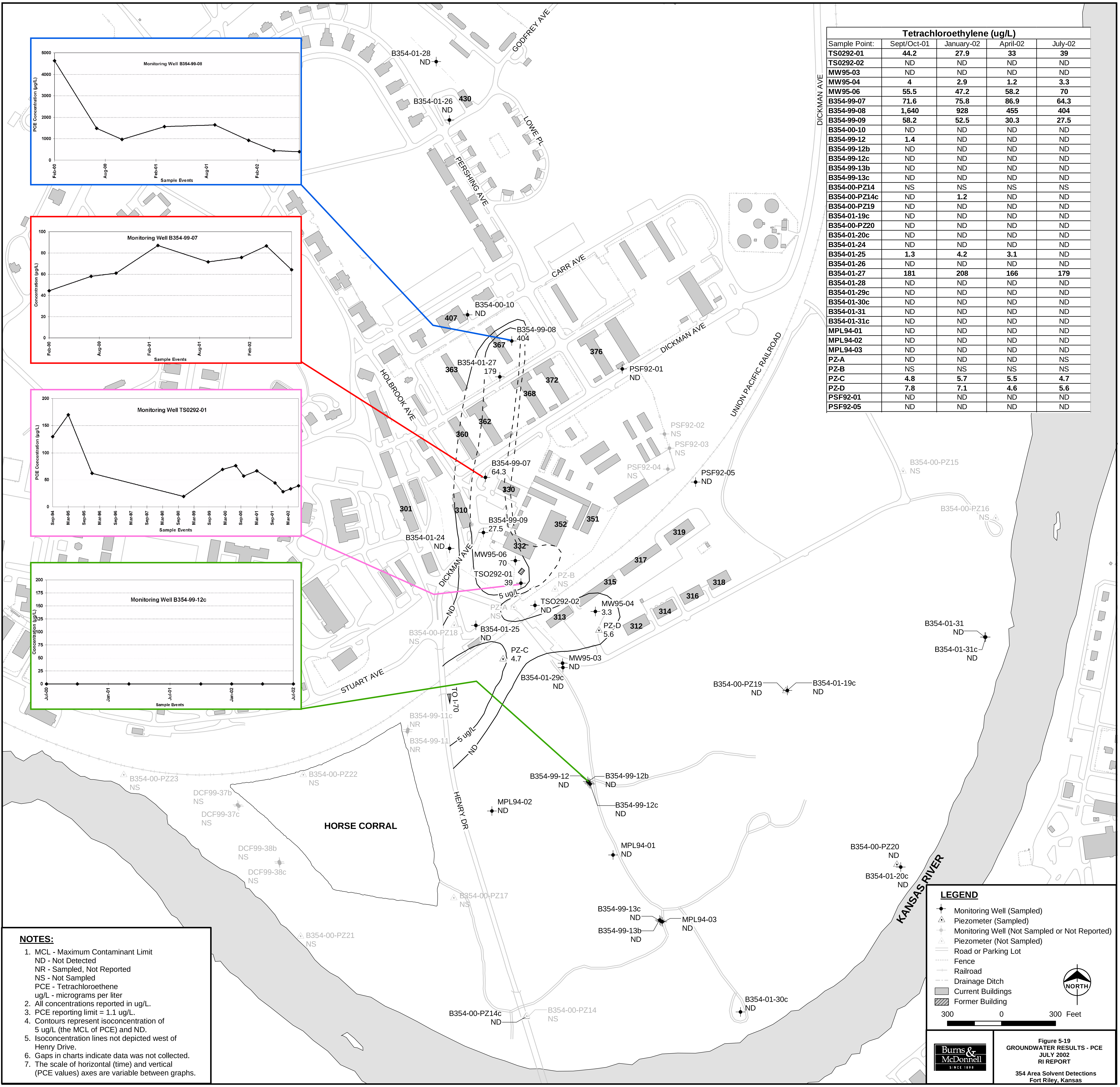
Figure 5-18
SOIL-GAS SCREENING LOCATIONS
TCE COMPOSITE RESULTS
BUILDING 430
RI REPORT
354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/fr354/arc/arcdocs/RI Report/fig5-18_TCE_composite.mxd 1/06/03 cj EL 1:240



Tetrachloroethylene (ug/L)				
Sample Point:	Sept/Oct-01	January-02	April-02	July-02
TS0292-01	**44.2**	**27.9**	**33**	**39**
TS0292-02	ND	ND	ND	ND
MW95-03	ND	ND	ND	ND
MW95-04	**4**	**2.9**	**1.2**	**3.3**
MW95-06	**55.5**	**47.2**	**58.2**	**70**
B354-99-07	**71.6**	**75.8**	**86.9**	**64.3**
B354-99-08	**1,640**	**928**	**455**	**404**
B354-99-09	**58.2**	**52.5**	**30.3**	**27.5**
B354-00-10	ND	ND	ND	ND
B354-99-12	**1.4**	ND	ND	ND
B354-99-12b	ND	ND	ND	ND
B354-99-12c	ND	ND	ND	ND
B354-99-13b	ND	ND	ND	ND
B354-99-13c	ND	ND	ND	ND
B354-00-PZ14	NS	NS	NS	NS
B354-00-PZ14c	ND	**1.2**	ND	ND
B354-00-PZ19	ND	ND	ND	ND
B354-01-19c	ND	ND	ND	ND
B354-00-PZ20	ND	ND	ND	ND
B354-01-20c	ND	ND	ND	ND
B354-01-24	ND	ND	ND	ND
B354-01-25	**1.3**	**4.2**	**3.1**	ND
B354-01-26	ND	ND	ND	ND
B354-01-27	**181**	**208**	**166**	**179**
B354-01-28	ND	ND	ND	ND
B354-01-29c	ND	ND	ND	ND
B354-01-30c	ND	ND	ND	ND
B354-01-31	ND	ND	ND	ND
B354-01-31c	ND	ND	ND	ND
MPL94-01	ND	ND	ND	ND
MPL94-02	ND	ND	ND	ND
MPL94-03	ND	ND	ND	ND
PZ-A	ND	ND	ND	NS
PZ-B	NS	NS	NS	NS
PZ-C	**4.8**	**5.7**	**5.5**	**4.7**
PZ-D	**7.8**	**7.1**	**4.6**	**5.6**
PSF92-01	ND	ND	ND	ND
PSF92-05	ND	ND	ND	ND

NOTES:

1. MCL - Maximum Contaminant Limit
   ND - Not Detected
   NR - Sampled, Not Reported
   NS - Not Sampled
   PCE - Tetrachloroethene
   ug/L - micrograms per liter
2. All concentrations reported in ug/L.
3. PCE reporting limit = 1.1 ug/L.
4. Contours represent isoconcentration of 5 ug/L (the MCL of PCE) and ND.
5. Isoconcentration lines not depicted west of Henry Drive.
6. Gaps in charts indicate data was not collected.
7. The scale of horizontal (time) and vertical (PCE values) axes are variable between graphs.

LEGEND

✦	Monitoring Well (Sampled)
△	Piezometer (Sampled)
✦	Monitoring Well (Not Sampled or Not Reported)
△	Piezometer (Not Sampled)
═	Road or Parking Lot
┄	Fence
┼	Railroad
─ ─	Drainage Ditch
▭	Current Buildings
▨	Former Building

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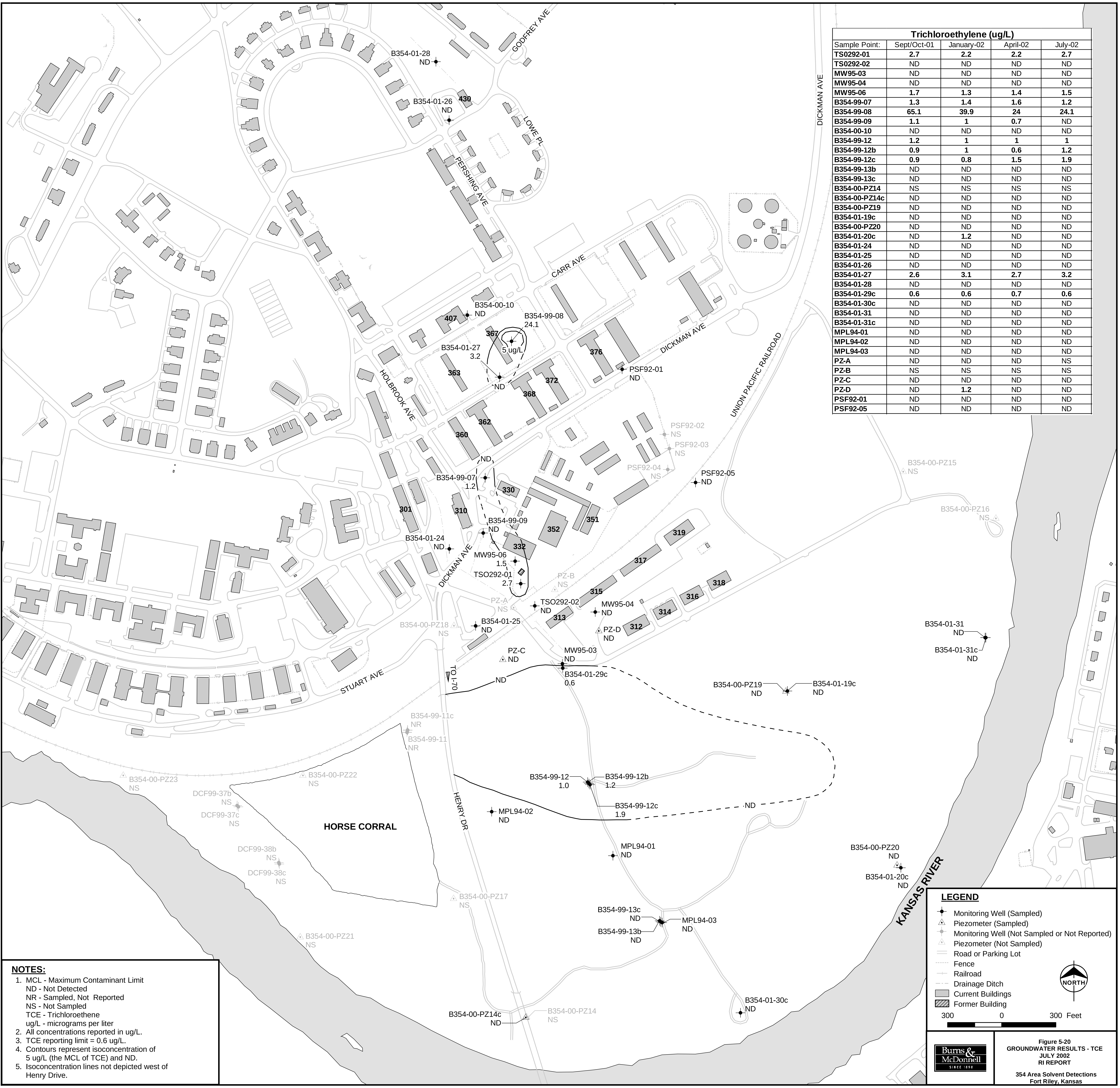
Figure 5-19
GROUNDWATER RESULTS - PCE
JULY 2002
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/ri report/Fig5-19_PCE.mxd 04/16/03 cjl el 1:3600



Trichloroethylene (ug/L)				
Sample Point:	Sept/Oct-01	January-02	April-02	July-02
TS0292-01	**2.7**	**2.2**	**2.2**	**2.7**
TS0292-02	ND	ND	ND	ND
MW95-03	ND	ND	ND	ND
MW95-04	ND	ND	ND	ND
MW95-06	**1.7**	**1.3**	**1.4**	**1.5**
B354-99-07	**1.3**	**1.4**	**1.6**	**1.2**
B354-99-08	**65.1**	**39.9**	**24**	**24.1**
B354-99-09	**1.1**	**1**	**0.7**	ND
B354-00-10	ND	ND	ND	ND
B354-99-12	**1.2**	**1**	**1**	**1**
B354-99-12b	**0.9**	**1**	**0.6**	**1.2**
B354-99-12c	**0.9**	**0.8**	**1.5**	**1.9**
B354-99-13b	ND	ND	ND	ND
B354-99-13c	ND	ND	ND	ND
B354-00-PZ14	NS	NS	NS	NS
B354-00-PZ14c	ND	ND	ND	ND
B354-00-PZ19	ND	ND	ND	ND
B354-01-19c	ND	ND	ND	ND
B354-00-PZ20	ND	ND	ND	ND
B354-01-20c	ND	**1.2**	ND	ND
B354-01-24	ND	ND	ND	ND
B354-01-25	ND	ND	ND	ND
B354-01-26	ND	ND	ND	ND
B354-01-27	**2.6**	**3.1**	**2.7**	**3.2**
B354-01-28	ND	ND	ND	ND
B354-01-29c	**0.6**	**0.6**	**0.7**	**0.6**
B354-01-30c	ND	ND	ND	ND
B354-01-31	ND	ND	ND	ND
B354-01-31c	ND	ND	ND	ND
MPL94-01	ND	ND	ND	ND
MPL94-02	ND	ND	ND	ND
MPL94-03	ND	ND	ND	ND
PZ-A	ND	ND	ND	NS
PZ-B	NS	NS	NS	NS
PZ-C	ND	ND	ND	ND
PZ-D	ND	**1.2**	ND	ND
PSF92-01	ND	ND	ND	ND
PSF92-05	ND	ND	ND	ND

NOTES:

1. MCL - Maximum Contaminant Limit
   ND - Not Detected
   NR - Sampled, Not Reported
   NS - Not Sampled
   TCE - Trichloroethene
   ug/L - micrograms per liter
2. All concentrations reported in ug/L.
3. TCE reporting limit = 0.6 ug/L.
4. Contours represent isoconcentration of 5 ug/L (the MCL of TCE) and ND.
5. Isoconcentration lines not depicted west of Henry Drive.

LEGEND

- Monitoring Well (Sampled)
- Piezometer (Sampled)
- Monitoring Well (Not Sampled or Not Reported)
- Piezometer (Not Sampled)
- Road or Parking Lot
- Fence
- Railroad
- Drainage Ditch
- Current Buildings
- ▨ Former Building

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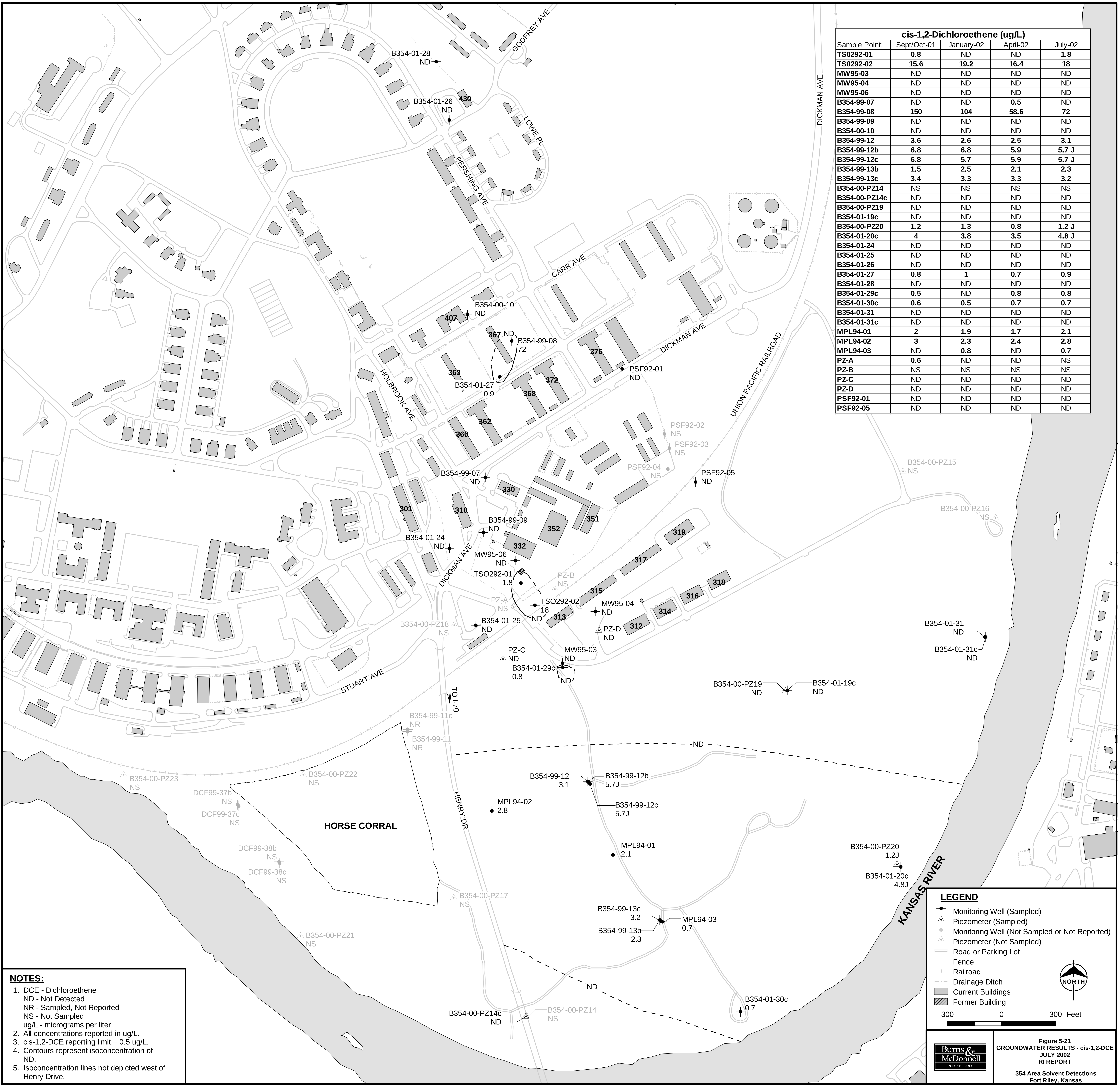
Figure 5-20
GROUNDWATER RESULTS - TCE
JULY 2002
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/ri report/Fig5-20_TCE.mxd 04/16/03 cjl el 1:3600



cis-1,2-Dichloroethene (ug/L)				
Sample Point:	Sept/Oct-01	January-02	April-02	July-02
TS0292-01	**0.8**	ND	ND	**1.8**
TS0292-02	**15.6**	**19.2**	**16.4**	**18**
MW95-03	ND	ND	ND	ND
MW95-04	ND	ND	ND	ND
MW95-06	ND	ND	ND	ND
B354-99-07	ND	ND	**0.5**	ND
B354-99-08	**150**	**104**	**58.6**	**72**
B354-99-09	ND	ND	ND	ND
B354-00-10	ND	ND	ND	ND
B354-99-12	**3.6**	**2.6**	**2.5**	**3.1**
B354-99-12b	**6.8**	**6.8**	**5.9**	**5.7 J**
B354-99-12c	**6.8**	**5.7**	**5.9**	**5.7 J**
B354-99-13b	**1.5**	**2.5**	**2.1**	**2.3**
B354-99-13c	**3.4**	**3.3**	**3.3**	**3.2**
B354-00-PZ14	NS	NS	NS	NS
B354-00-PZ14c	ND	ND	ND	ND
B354-00-PZ19	ND	ND	ND	ND
B354-01-19c	ND	ND	ND	ND
B354-00-PZ20	**1.2**	**1.3**	**0.8**	**1.2 J**
B354-01-20c	**4**	**3.8**	**3.5**	**4.8 J**
B354-01-24	ND	ND	ND	ND
B354-01-25	ND	ND	ND	ND
B354-01-26	ND	ND	ND	ND
B354-01-27	**0.8**	**1**	**0.7**	**0.9**
B354-01-28	ND	ND	ND	ND
B354-01-29c	**0.5**	ND	**0.8**	**0.8**
B354-01-30c	**0.6**	**0.5**	**0.7**	**0.7**
B354-01-31	ND	ND	ND	ND
B354-01-31c	ND	ND	ND	ND
MPL94-01	**2**	**1.9**	**1.7**	**2.1**
MPL94-02	**3**	**2.3**	**2.4**	**2.8**
MPL94-03	ND	**0.8**	ND	**0.7**
PZ-A	**0.6**	ND	ND	NS
PZ-B	NS	NS	NS	NS
PZ-C	ND	ND	ND	ND
PZ-D	ND	ND	ND	ND
PSF92-01	ND	ND	ND	ND
PSF92-05	ND	ND	ND	ND

NOTES:

1. DCE - Dichloroethene
   ND - Not Detected
   NR - Sampled, Not Reported
   NS - Not Sampled
   ug/L - micrograms per liter
2. All concentrations reported in ug/L.
3. cis-1,2-DCE reporting limit = 0.5 ug/L.
4. Contours represent isoconcentration of ND.
5. Isoconcentration lines not depicted west of Henry Drive.

LEGEND

- Monitoring Well (Sampled)
- Piezometer (Sampled)
- Monitoring Well (Not Sampled or Not Reported)
- Piezometer (Not Sampled)
- Road or Parking Lot
- Fence
- Railroad
- Drainage Ditch
- Current Buildings
- ▨ Former Building

300 0 300 Feet

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Figure 5-21
GROUNDWATER RESULTS - cis-1,2-DCE
JULY 2002
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

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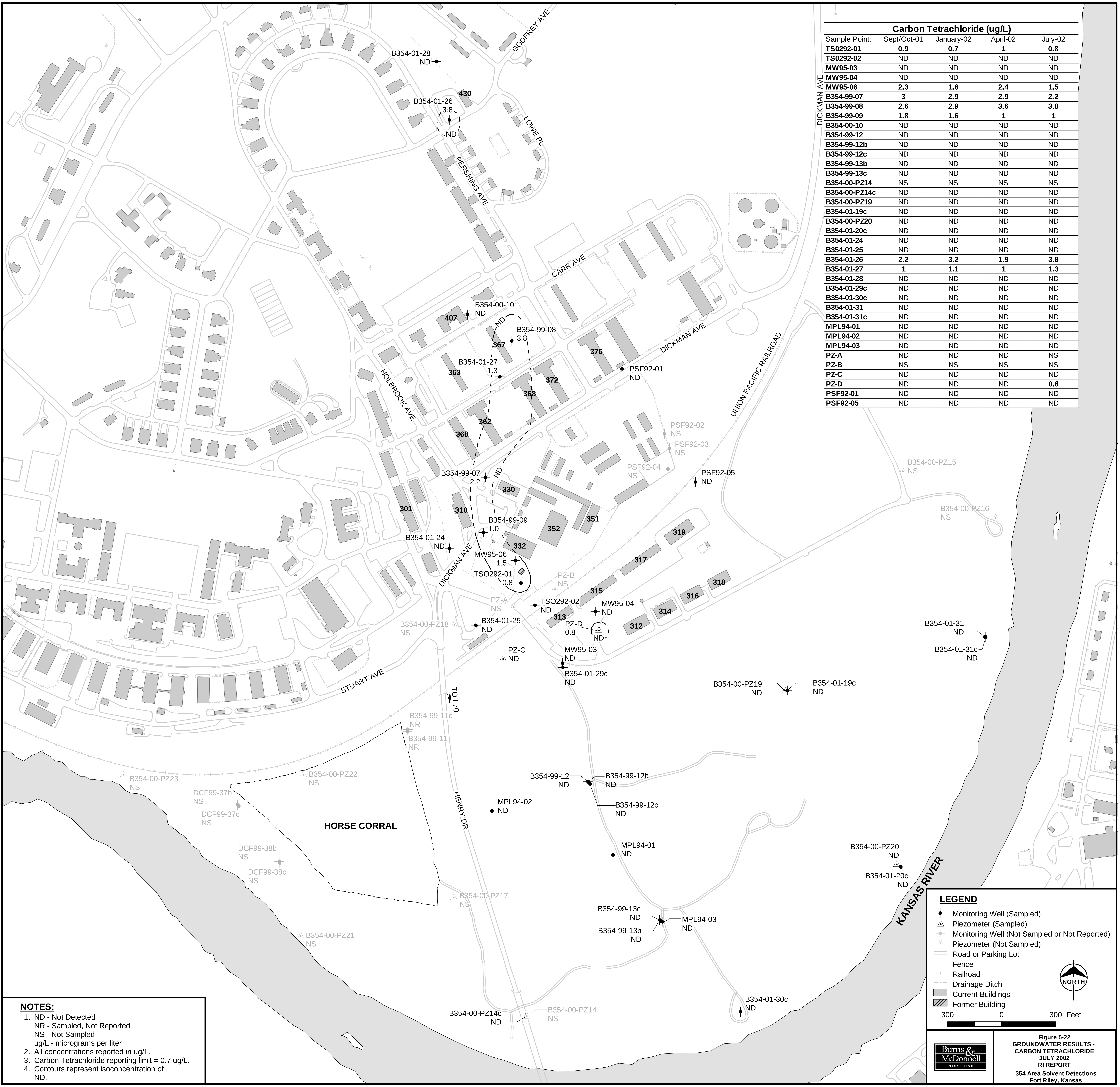


Carbon Tetrachloride (ug/L)

Sample Point:	Sept/Oct-01	January-02	April-02	July-02
TS0292-01	**0.9**	**0.7**	**1**	**0.8**
TS0292-02	ND	ND	ND	ND
MW95-03	ND	ND	ND	ND
MW95-04	ND	ND	ND	ND
MW95-06	**2.3**	**1.6**	**2.4**	**1.5**
B354-99-07	**3**	**2.9**	**2.9**	**2.2**
B354-99-08	**2.6**	**2.9**	**3.6**	**3.8**
B354-99-09	**1.8**	**1.6**	**1**	**1**
B354-00-10	ND	ND	ND	ND
B354-99-12	ND	ND	ND	ND
B354-99-12b	ND	ND	ND	ND
B354-99-12c	ND	ND	ND	ND
B354-99-13b	ND	ND	ND	ND
B354-99-13c	ND	ND	ND	ND
B354-00-PZ14	NS	NS	NS	NS
B354-00-PZ14c	ND	ND	ND	ND
B354-00-PZ19	ND	ND	ND	ND
B354-01-19c	ND	ND	ND	ND
B354-00-PZ20	ND	ND	ND	ND
B354-01-20c	ND	ND	ND	ND
B354-01-24	ND	ND	ND	ND
B354-01-25	ND	ND	ND	ND
B354-01-26	**2.2**	**3.2**	**1.9**	**3.8**
B354-01-27	**1**	**1.1**	**1**	**1.3**
B354-01-28	ND	ND	ND	ND
B354-01-29c	ND	ND	ND	ND
B354-01-30c	ND	ND	ND	ND
B354-01-31	ND	ND	ND	ND
B354-01-31c	ND	ND	ND	ND
MPL94-01	ND	ND	ND	ND
MPL94-02	ND	ND	ND	ND
MPL94-03	ND	ND	ND	ND
PZ-A	ND	ND	ND	NS
PZ-B	NS	NS	NS	NS
PZ-C	ND	ND	ND	ND
PZ-D	ND	ND	ND	**0.8**
PSF92-01	ND	ND	ND	ND
PSF92-05	ND	ND	ND	ND

NOTES:

1. ND - Not Detected
   NR - Sampled, Not Reported
   NS - Not Sampled
   ug/L - micrograms per liter
2. All concentrations reported in ug/L.
3. Carbon Tetrachloride reporting limit = 0.7 ug/L.
4. Contours represent isoconcentration of ND.

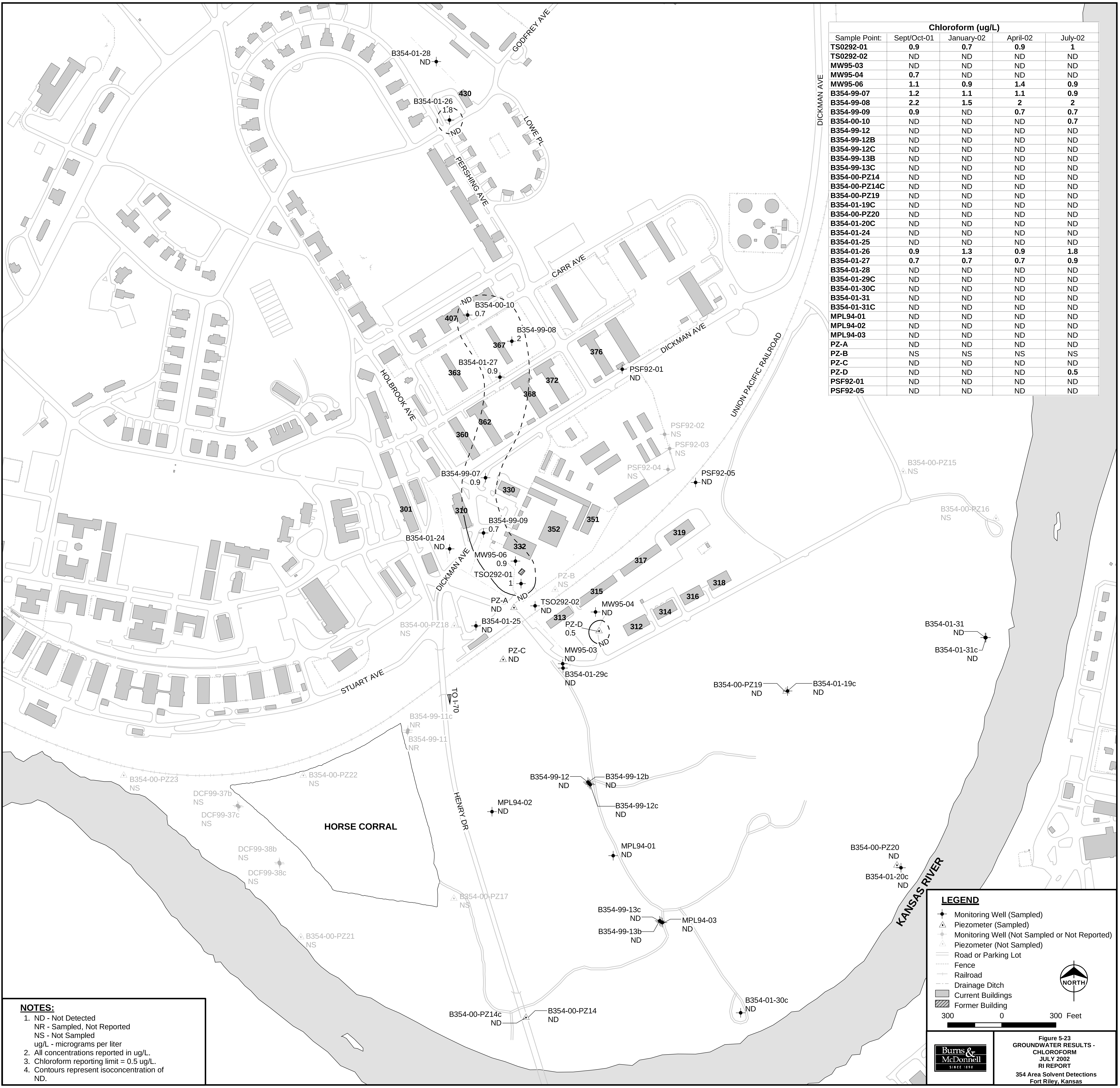
LEGEND

- Monitoring Well (Sampled)
- Piezometer (Sampled)
- Monitoring Well (Not Sampled or Not Reported)
- Piezometer (Not Sampled)
- Road or Parking Lot
- Fence
- Railroad
- Drainage Ditch
- Current Buildings
- Former Building

Burns & McDonnell
SINCE 1898

Figure 5-22
GROUNDWATER RESULTS - CARBON TETRACHLORIDE
JULY 2002
RI REPORT
354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/ri report/Fig5-22_CarbonTet.mxd 04/16/03 cjl el 1:3600



Chloroform (ug/L)				
Sample Point:	Sept/Oct-01	January-02	April-02	July-02
TS0292-01	**0.9**	**0.7**	**0.9**	**1**
TS0292-02	ND	ND	ND	ND
MW95-03	ND	ND	ND	ND
MW95-04	**0.7**	ND	ND	ND
MW95-06	**1.1**	**0.9**	**1.4**	**0.9**
B354-99-07	**1.2**	**1.1**	**1.1**	**0.9**
B354-99-08	**2.2**	**1.5**	**2**	**2**
B354-99-09	**0.9**	ND	**0.7**	**0.7**
B354-00-10	ND	ND	ND	**0.7**
B354-99-12	ND	ND	ND	ND
B354-99-12B	ND	ND	ND	ND
B354-99-12C	ND	ND	ND	ND
B354-99-13B	ND	ND	ND	ND
B354-99-13C	ND	ND	ND	ND
B354-00-PZ14	ND	ND	ND	ND
B354-00-PZ14C	ND	ND	ND	ND
B354-00-PZ19	ND	ND	ND	ND
B354-01-19C	ND	ND	ND	ND
B354-00-PZ20	ND	ND	ND	ND
B354-01-20C	ND	ND	ND	ND
B354-01-24	ND	ND	ND	ND
B354-01-25	ND	ND	ND	ND
B354-01-26	**0.9**	**1.3**	**0.9**	**1.8**
B354-01-27	**0.7**	**0.7**	**0.7**	**0.9**
B354-01-28	ND	ND	ND	ND
B354-01-29C	ND	ND	ND	ND
B354-01-30C	ND	ND	ND	ND
B354-01-31	ND	ND	ND	ND
B354-01-31C	ND	ND	ND	ND
MPL94-01	ND	ND	ND	ND
MPL94-02	ND	ND	ND	ND
MPL94-03	ND	ND	ND	ND
PZ-A	ND	ND	ND	ND
PZ-B	NS	NS	NS	NS
PZ-C	ND	ND	ND	ND
PZ-D	ND	ND	ND	**0.5**
PSF92-01	ND	ND	ND	ND
PSF92-05	ND	ND	ND	ND

LEGEND

✦	Monitoring Well (Sampled)
△	Piezometer (Sampled)
✦	Monitoring Well (Not Sampled or Not Reported)
△	Piezometer (Not Sampled)
═	Road or Parking Lot
┄	Fence
┼	Railroad
─ · ─	Drainage Ditch
▭	Current Buildings
▨	Former Building

NOTES:

1. ND - Not Detected
   NR - Sampled, Not Reported
   NS - Not Sampled
   ug/L - micrograms per liter
2. All concentrations reported in ug/L.
3. Chloroform reporting limit = 0.5 ug/L.
4. Contours represent isoconcentration of ND.

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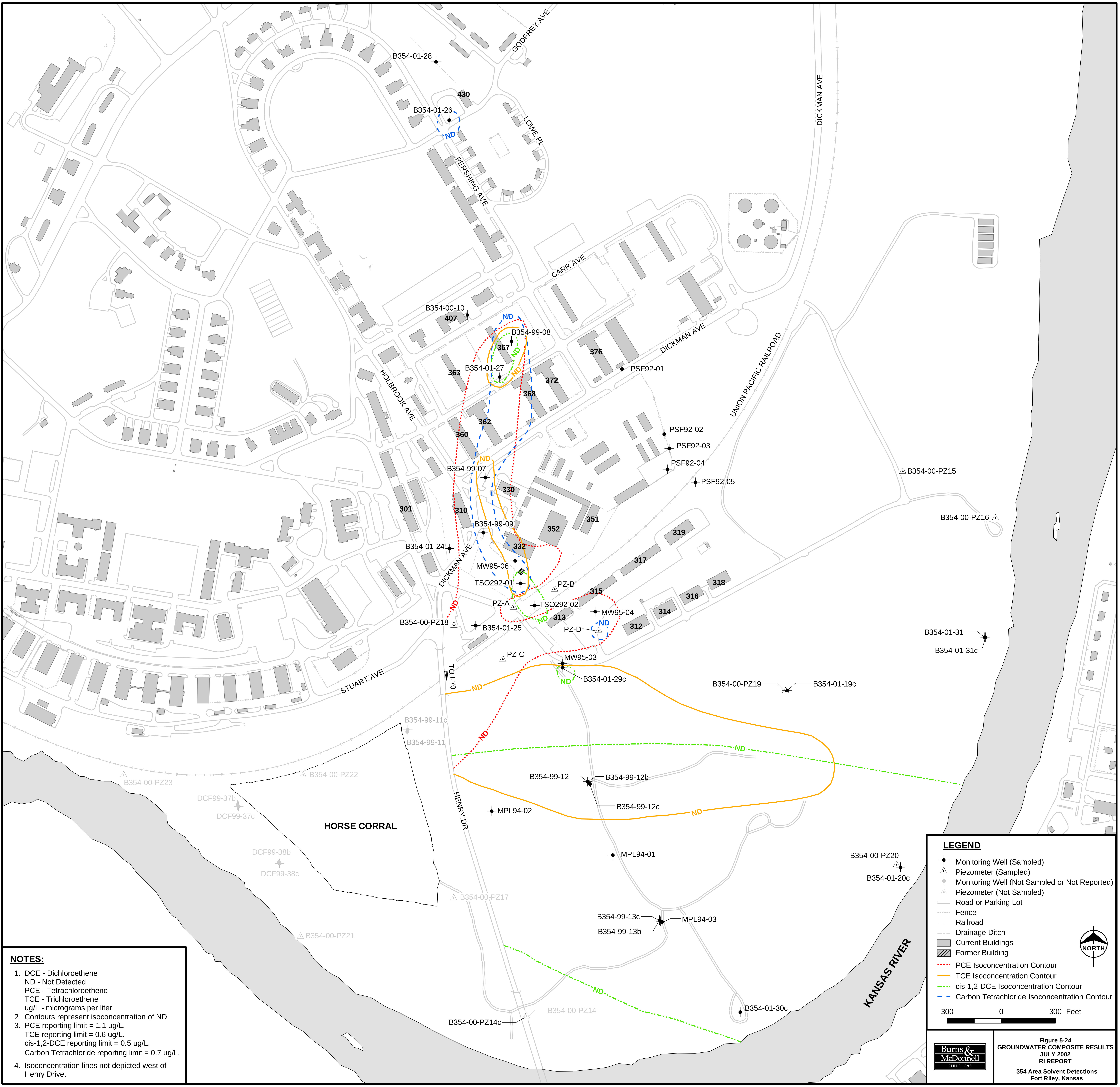
Figure 5-23
GROUNDWATER RESULTS -
CHLOROFORM
JULY 2002
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

u:/armycorp/projects/b354/arc/arcdocs/ri report/Fig5-23_Chloroform.mxd 04/18/03 cjl el 1:3600



NOTES:

1. DCE - Dichloroethene
   ND - Not Detected
   PCE - Tetrachloroethene
   TCE - Trichloroethene
   ug/L - micrograms per liter
2. Contours represent isoconcentration of ND.
3. PCE reporting limit = 1.1 ug/L.
   TCE reporting limit = 0.6 ug/L.
   cis-1,2-DCE reporting limit = 0.5 ug/L.
   Carbon Tetrachloride reporting limit = 0.7 ug/L.
4. Isoconcentration lines not depicted west of Henry Drive.

LEGEND

✦	Monitoring Well (Sampled)
△	Piezometer (Sampled)
✧	Monitoring Well (Not Sampled or Not Reported)
△	Piezometer (Not Sampled)
═	Road or Parking Lot
┈	Fence
┼	Railroad
─ ·	Drainage Ditch
▭	Current Buildings
▨	Former Building
┈	PCE Isoconcentration Contour
─	TCE Isoconcentration Contour
─ · ·	cis-1,2-DCE Isoconcentration Contour
─ ─	Carbon Tetrachloride Isoconcentration Contour

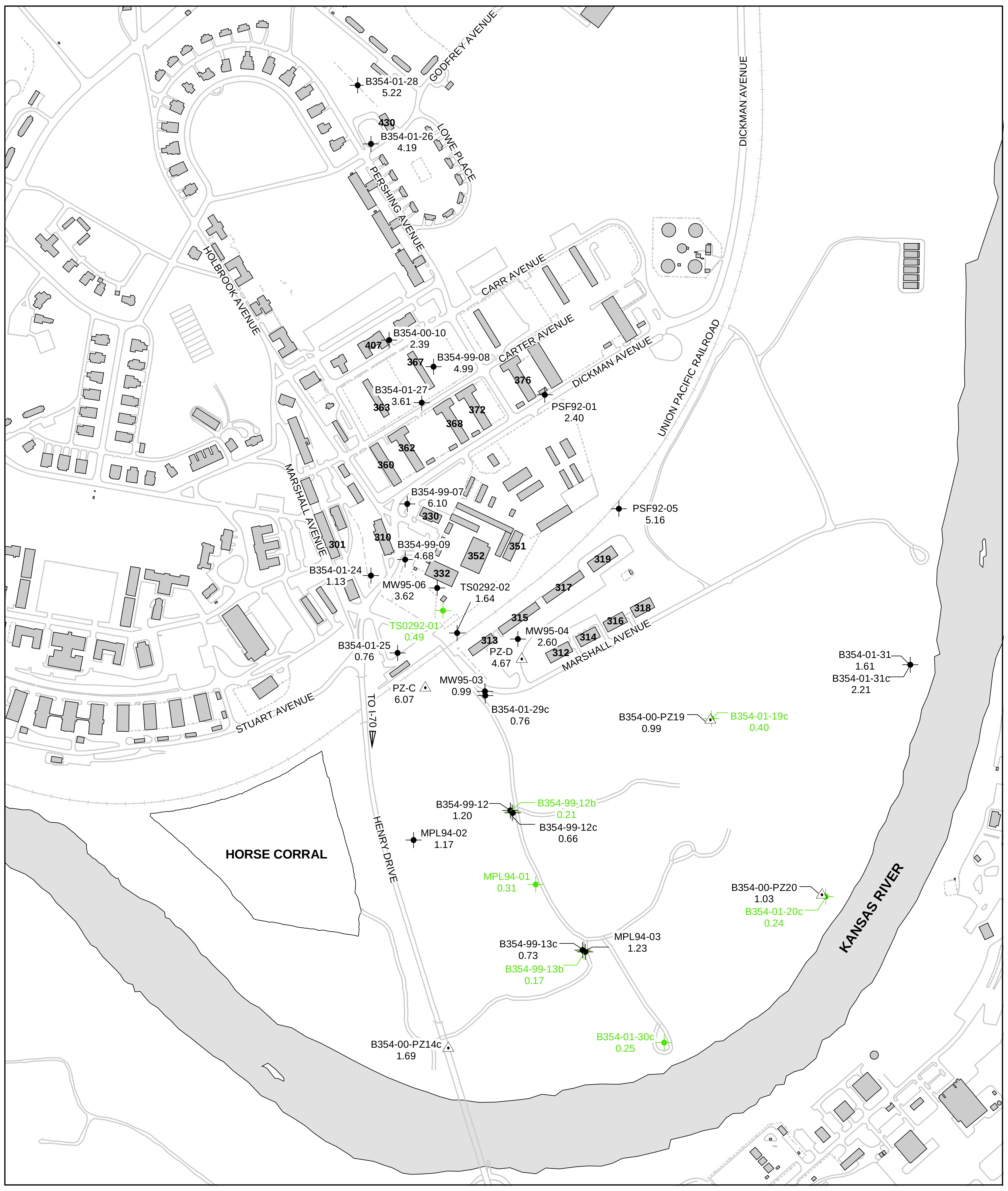
300 0 300 Feet

Burns & McDonnell
SINCE 1898

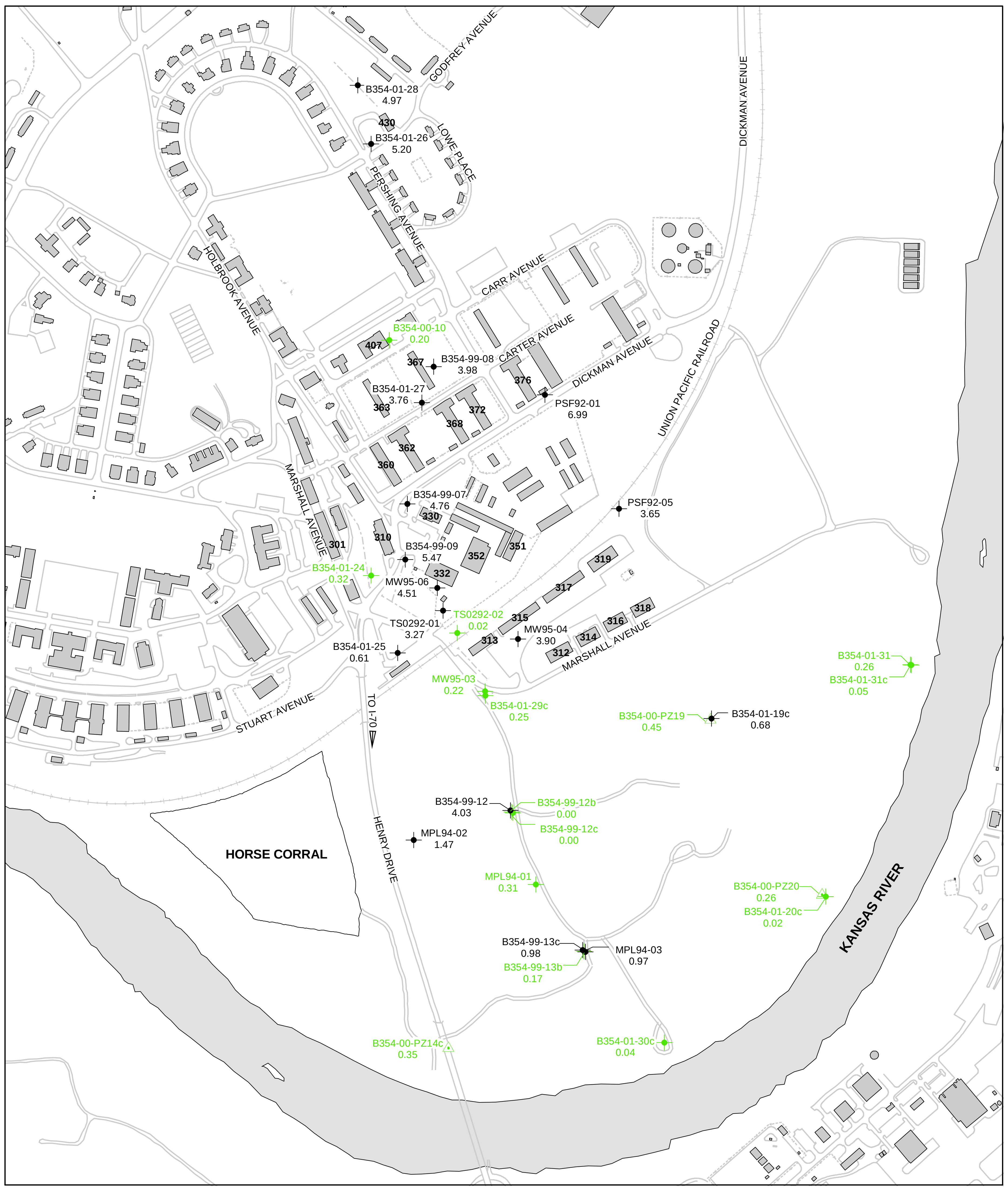
Figure 5-24
GROUNDWATER COMPOSITE RESULTS
JULY 2002
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

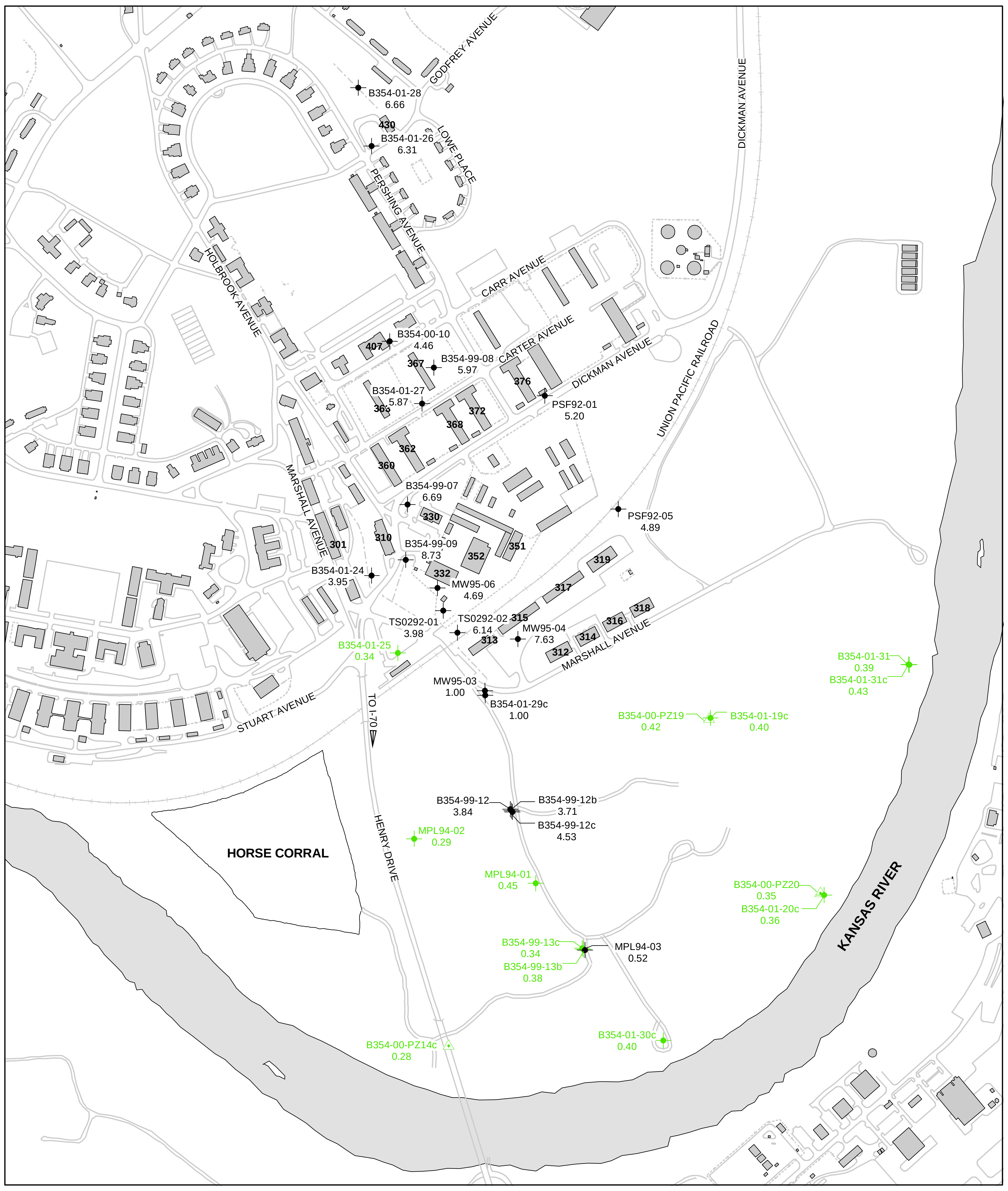
u:/armycorp/projects/b354/arc/arcdocs/ri report/Fig5-24_composite.mxd 04/15/03 cjl el 1:3600



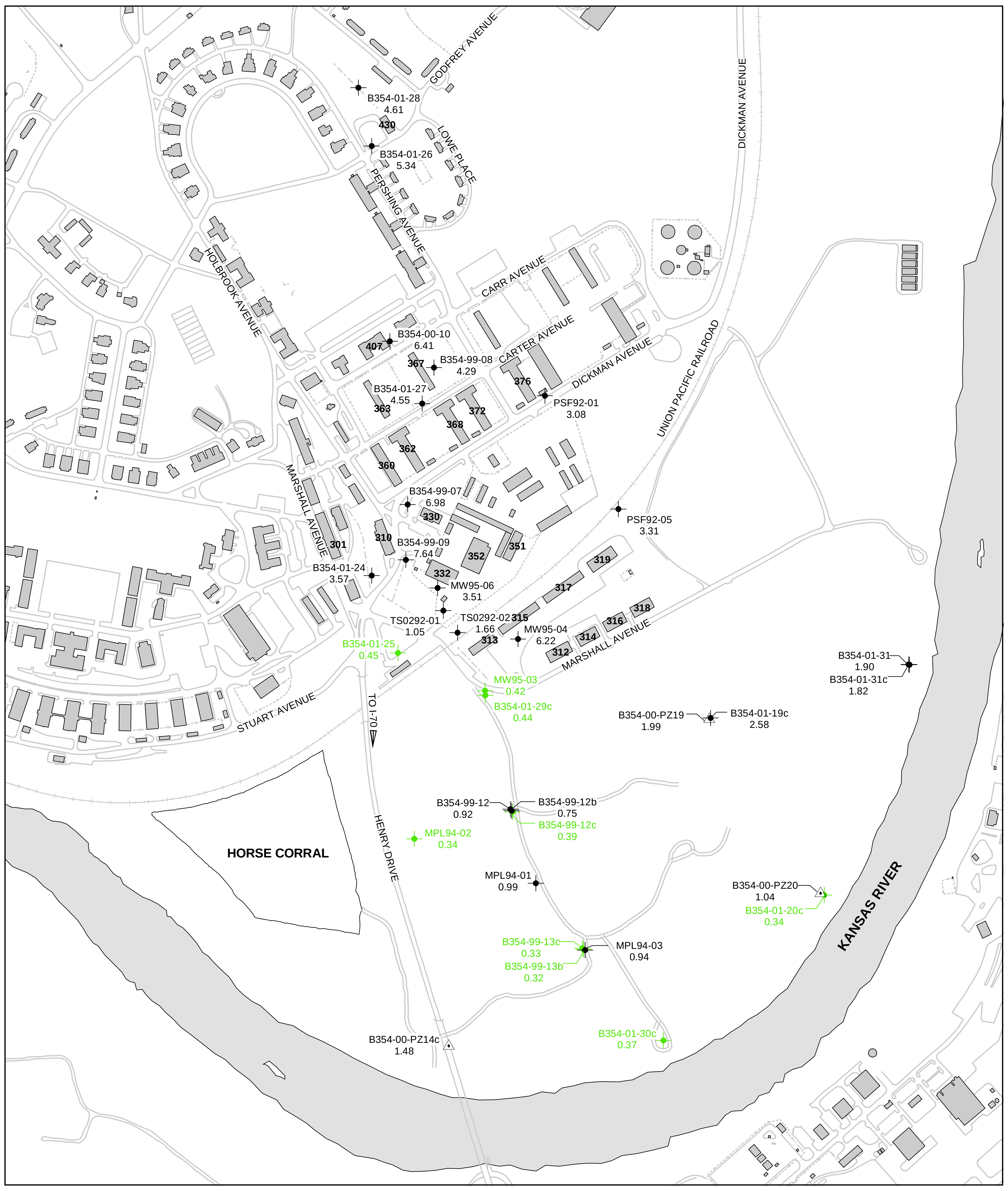
Fall 2001 (Favorable Geochemical Condition <0.5 mg/L)



Winter 2002 (Favorable Geochemical Condition <0.5 mg/L)



Spring 2002 (Favorable Geochemical Condition <0.5 mg/L)



Summer 2002 (Favorable Geochemical Condition <0.5 mg/L)

LEGEND

⊕	Monitoring Well (Favorable)
△	Piezometer (Favorable)
⊕	Monitoring Well (Not Favorable)
△	Monitoring Well (Not Favorable)
═	Road or Parking Lot
┄	Fence
┼	Railroad
─ · ─	Drainage Ditch
▨	Current Building

NOTE:

1. mg/L - milligrams per liter

NORTH

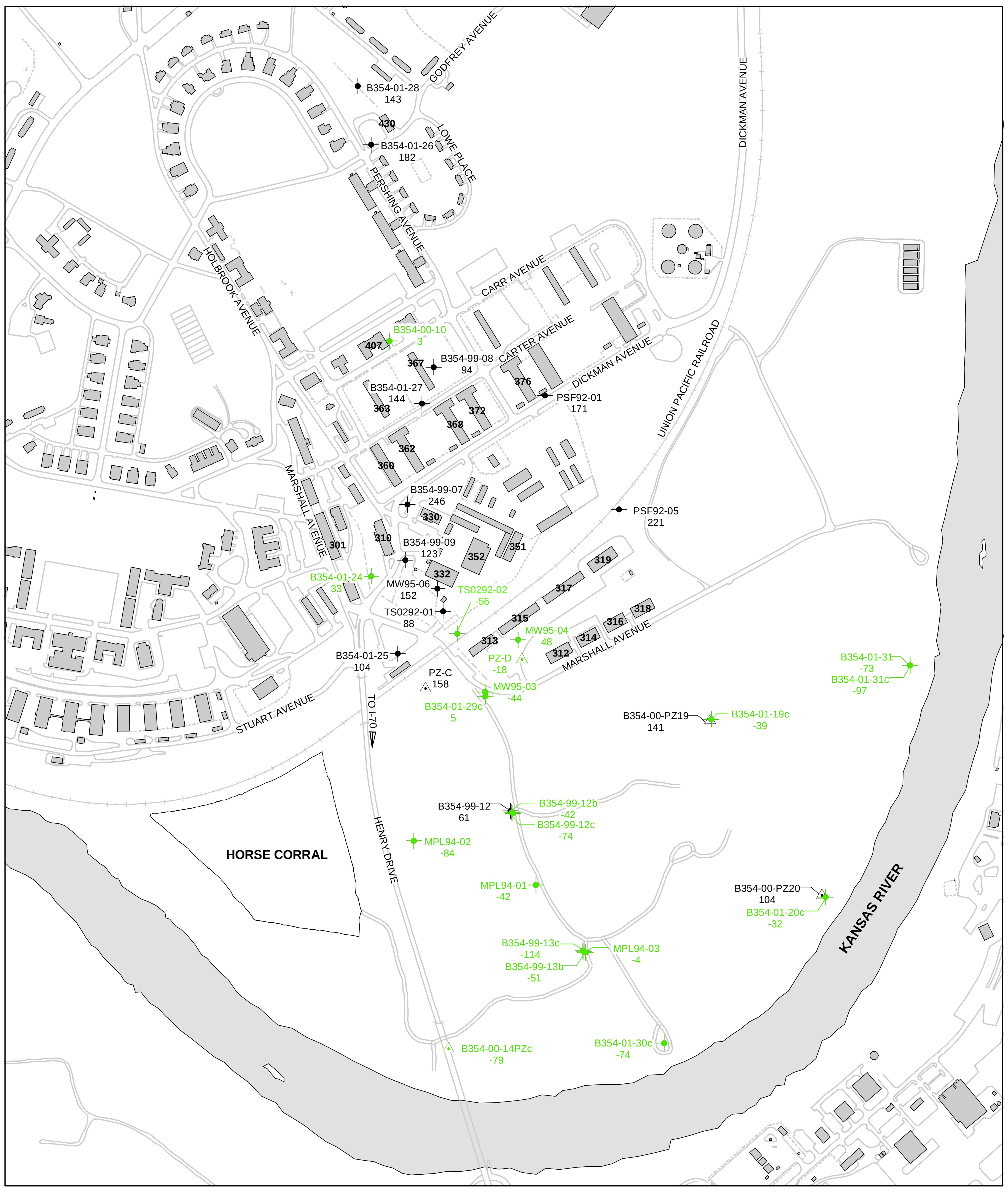
500 0 500 Feet

U:\armycorp\Projects\b354\ARC\ArcDocs\RI_Report\Fig6-1nat_atten_dissolved_oxygen.mxd cjl el 01/08/03

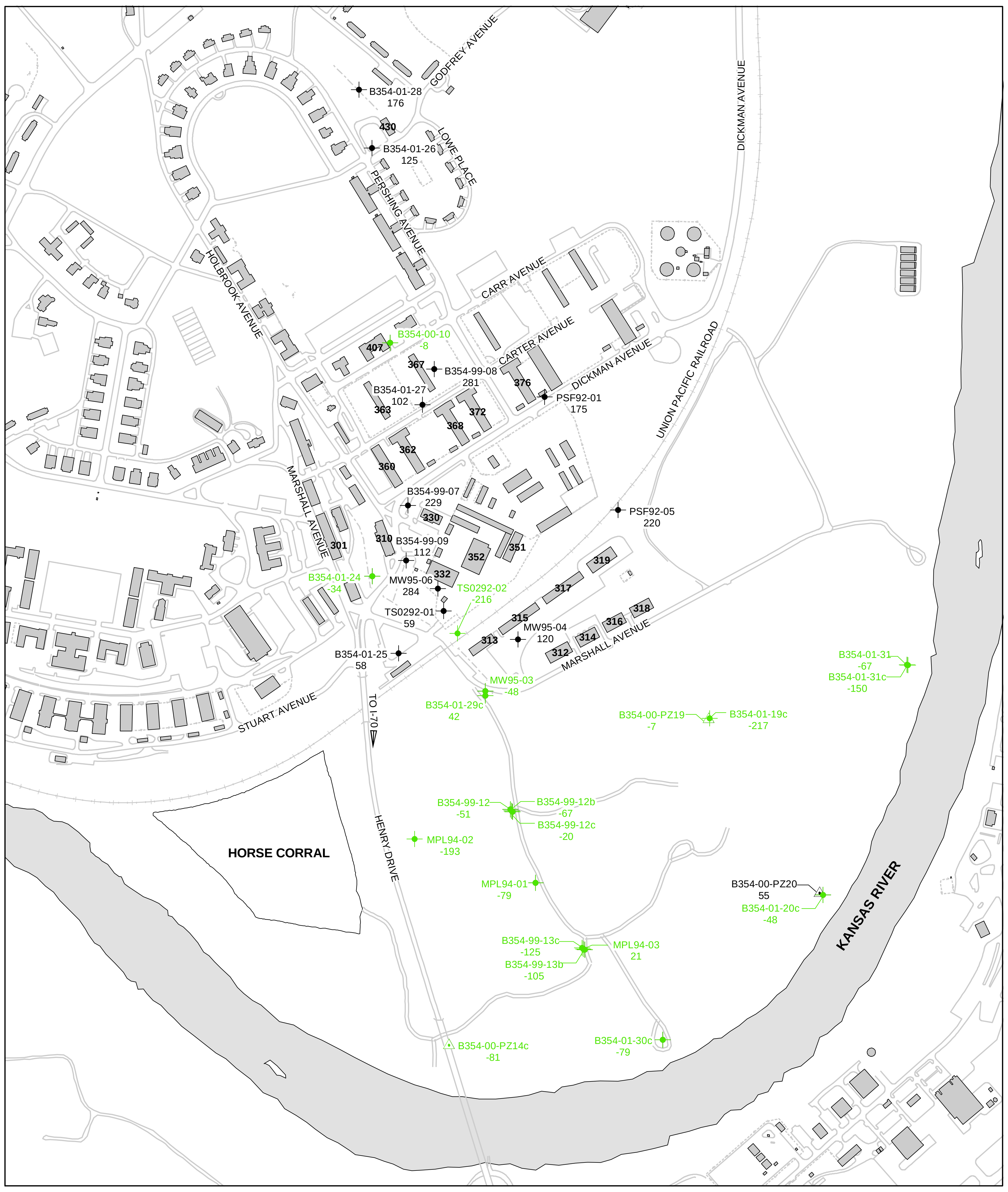
Burns & McDonnell
SINCE 1898

Figure 6-1
NATURAL ATTENUATION
DISSOLVED OXYGEN
RI REPORT

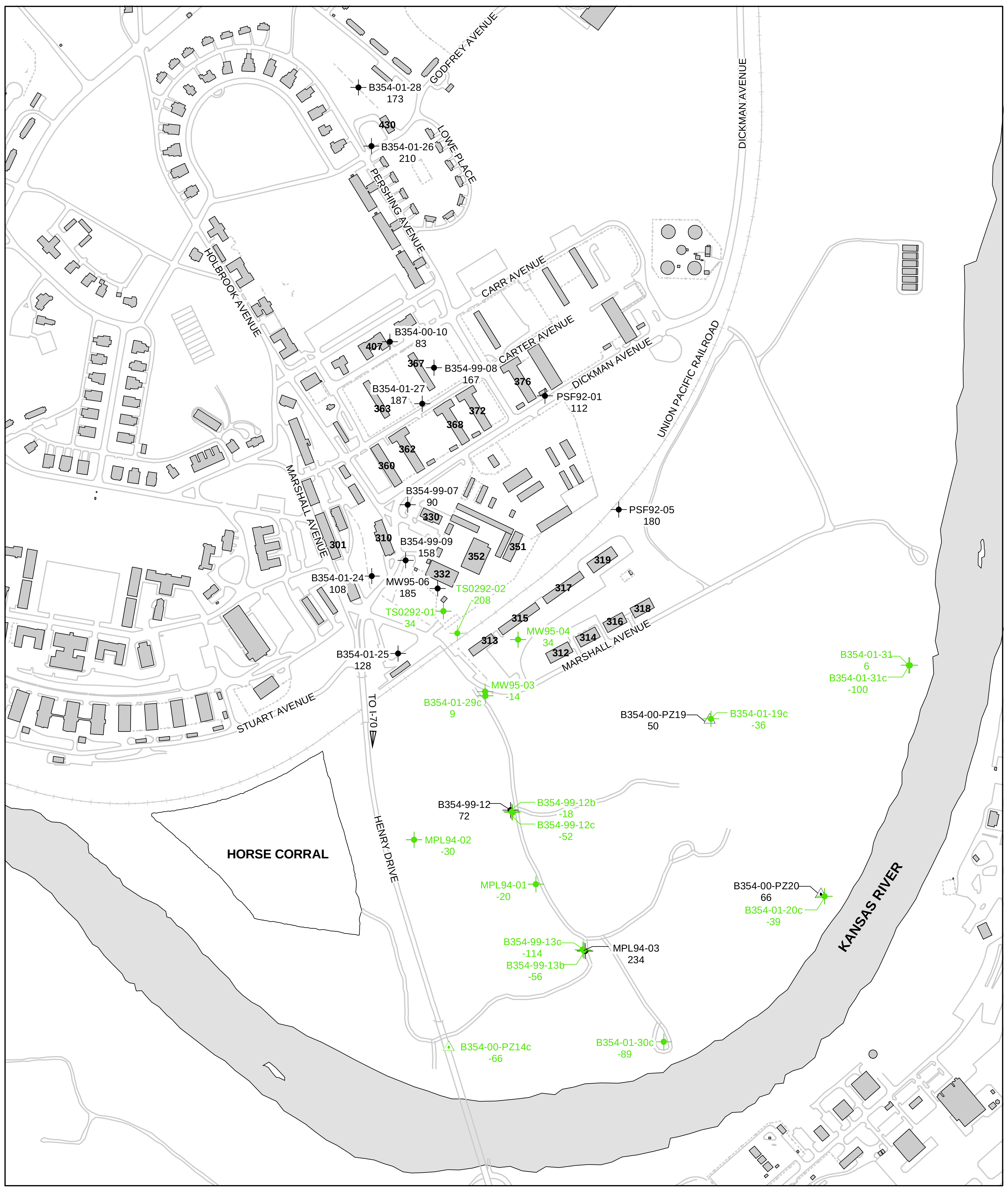
354 Area Solvent Detections
Fort Riley, Kansas



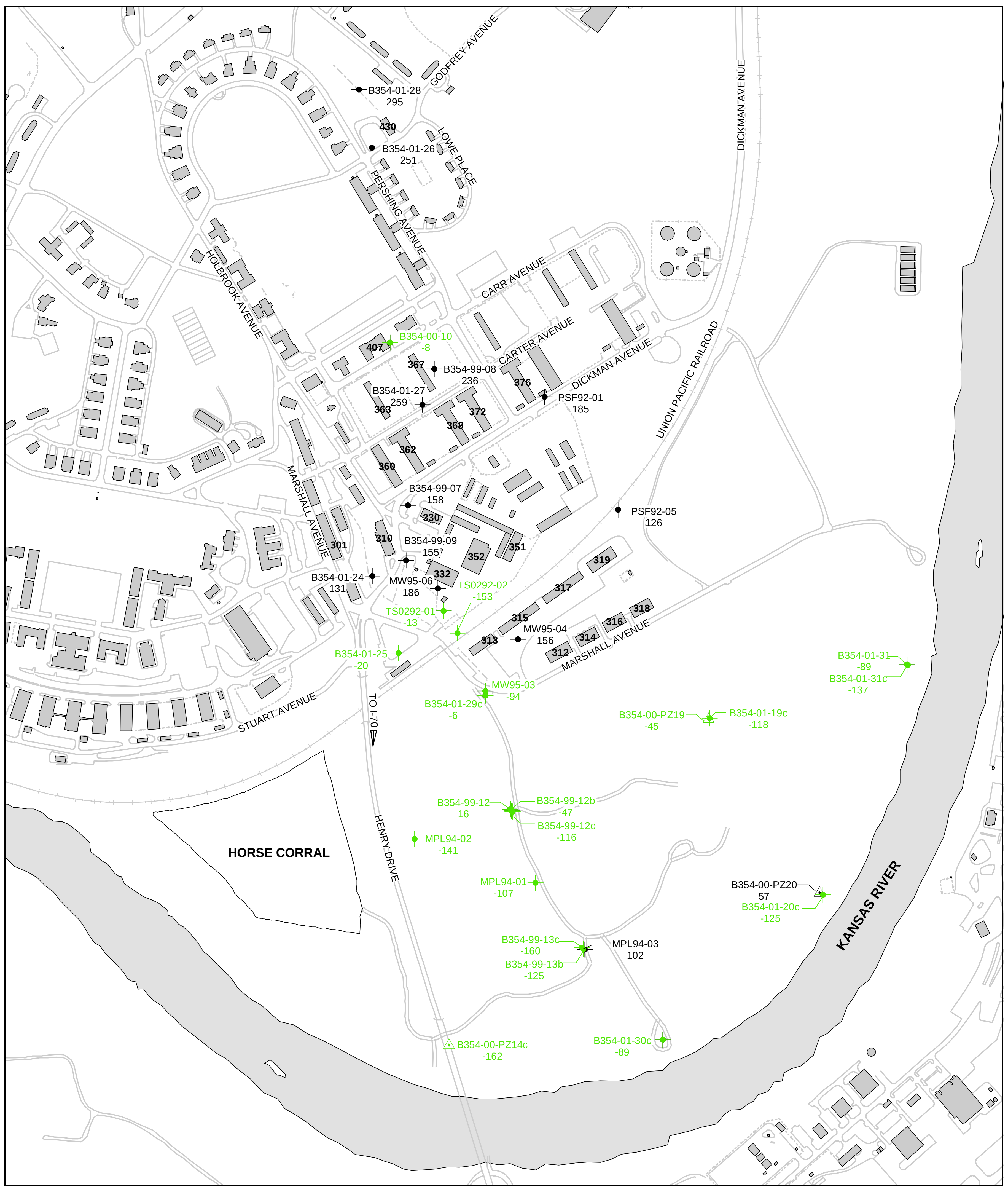
Fall 2001 (Favorable Geochemical Condition < 50 millivolts)



Winter 2002 (Favorable Geochemical Condition < 50 millivolts)



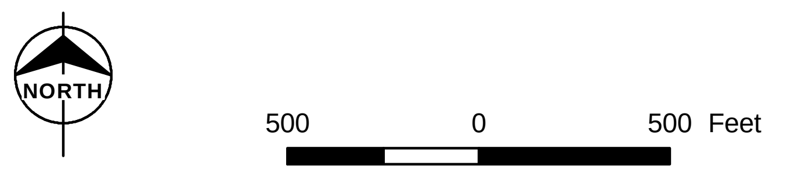
Spring 2002 (Favorable Geochemical Condition < 50 millivolts)



Summer 2002 (Favorable Geochemical Condition < 50 millivolts)

LEGEND

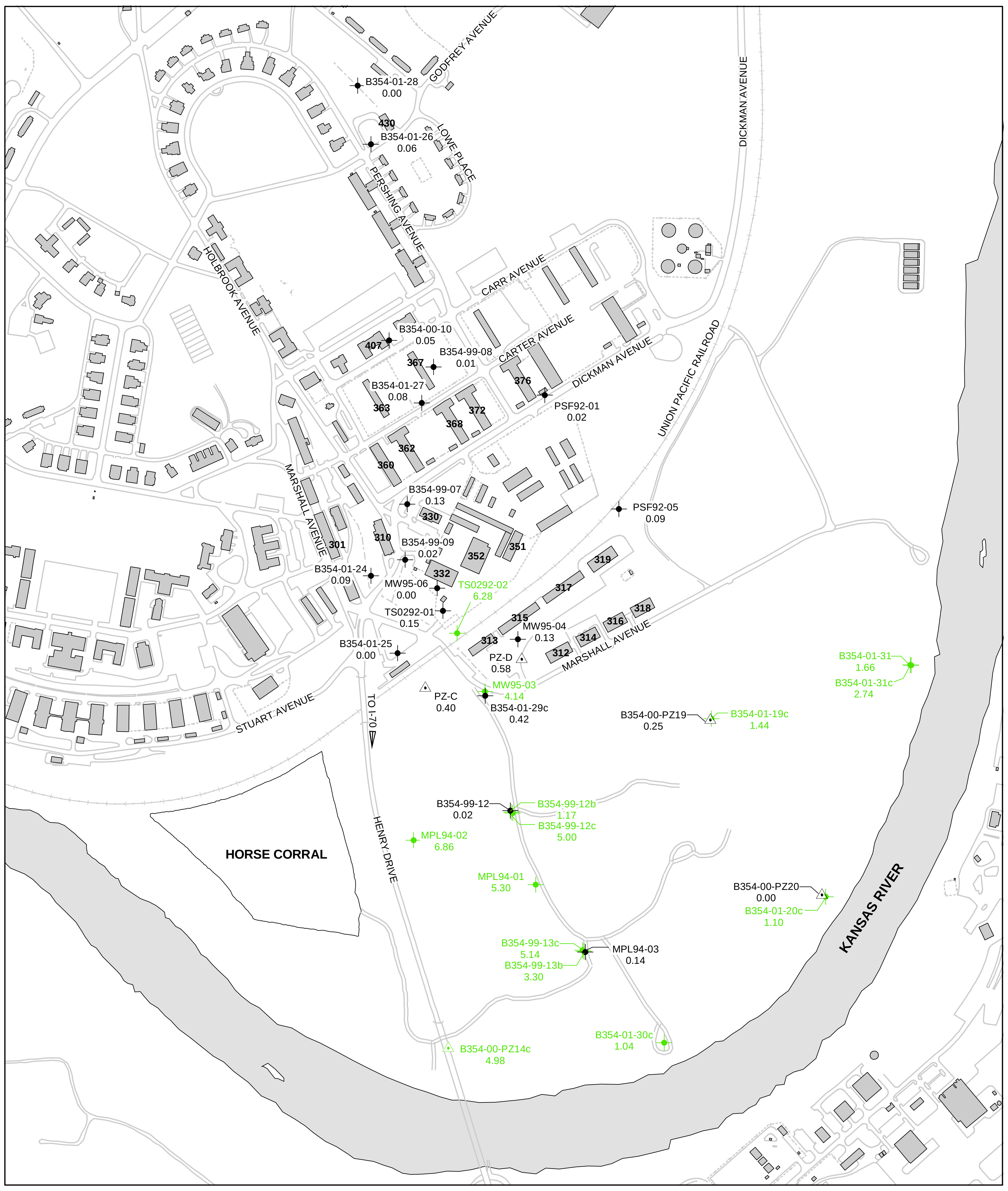
●	Monitoring Well (Favorable)	═	Road or Parking Lot
△	Piezometer (Favorable)	┄	Fence
●	Monitoring Well (Not Favorable)	┼	Railroad
△	Monitoring Well (Not Favorable)	─ ─	Drainage Ditch
		▨	Current Building



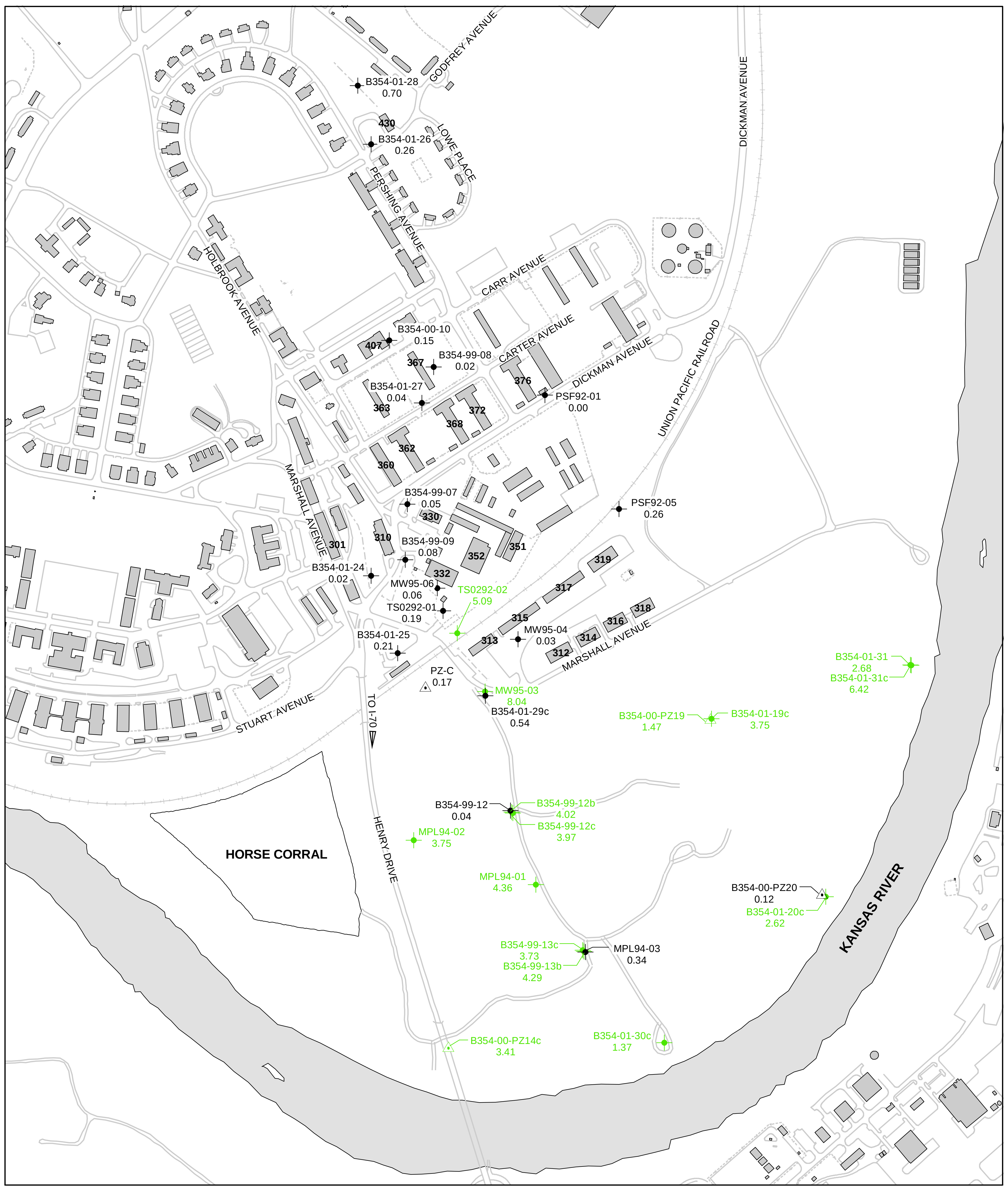
Burns & McDonnell
SINCE 1898

Figure 6-2
NATURAL ATTENUATION OXIDATION-REDUCTION POTENTIAL RI REPORT
354 Area Solvent Detections
Fort Riley, Kansas

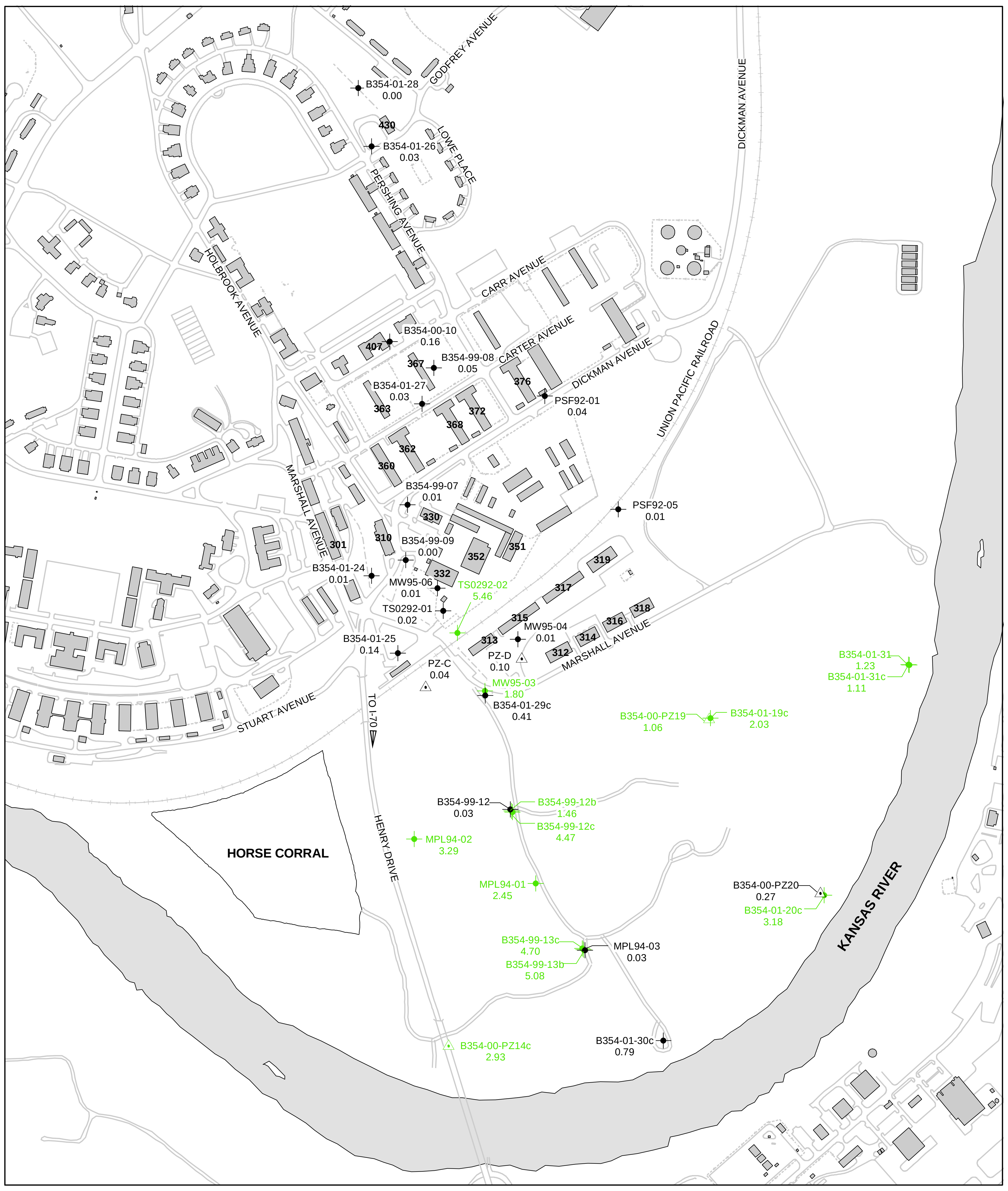
U:\armycorp\Projects\b354\ARC\ArcDocs\RI_Report\Fig6-2nat_atten_ORP.mxd cjl el 01/08/03



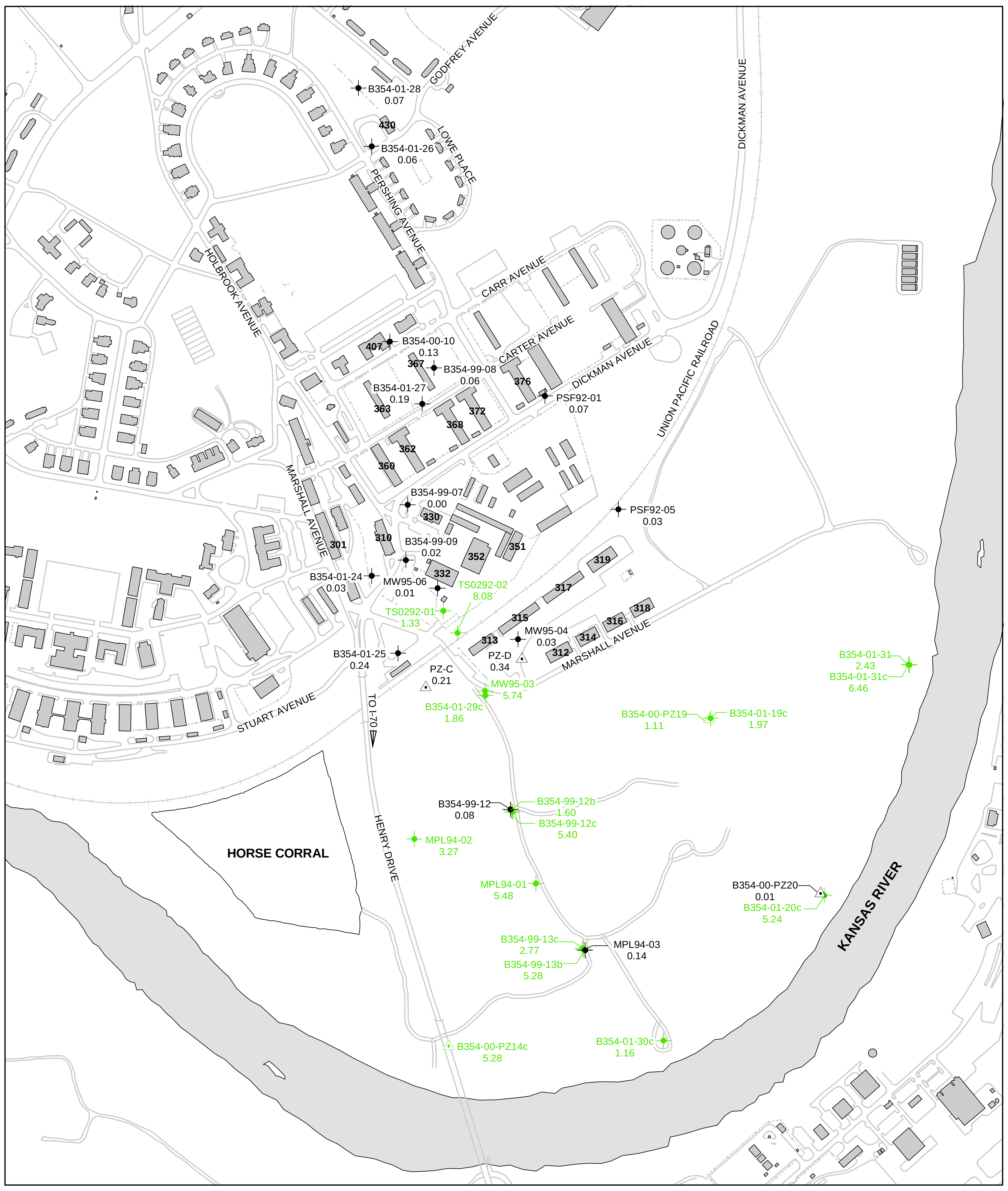
Fall 2001 (Favorable Geochemical Condition >1 mg/L)



Winter 2002 (Favorable Geochemical Condition >1 mg/L)



Spring 2002 (Favorable Geochemical Condition >1 mg/L)



Summer 2002 (Favorable Geochemical Condition >1 mg/L)

LEGEND

- ⌖ Monitoring Well (Favorable)
- △ Piezometer (Favorable)
- ⌖ Monitoring Well (Not Favorable)
- △ Monitoring Well (Not Favorable)
- ═ Road or Parking Lot
- ┅ Fence
- ┼ Railroad
- ─ · ─ Drainage Ditch
- ▨ Current Building

NOTE:

1. mg/L - milligrams per liter

NORTH

500 0 500 Feet

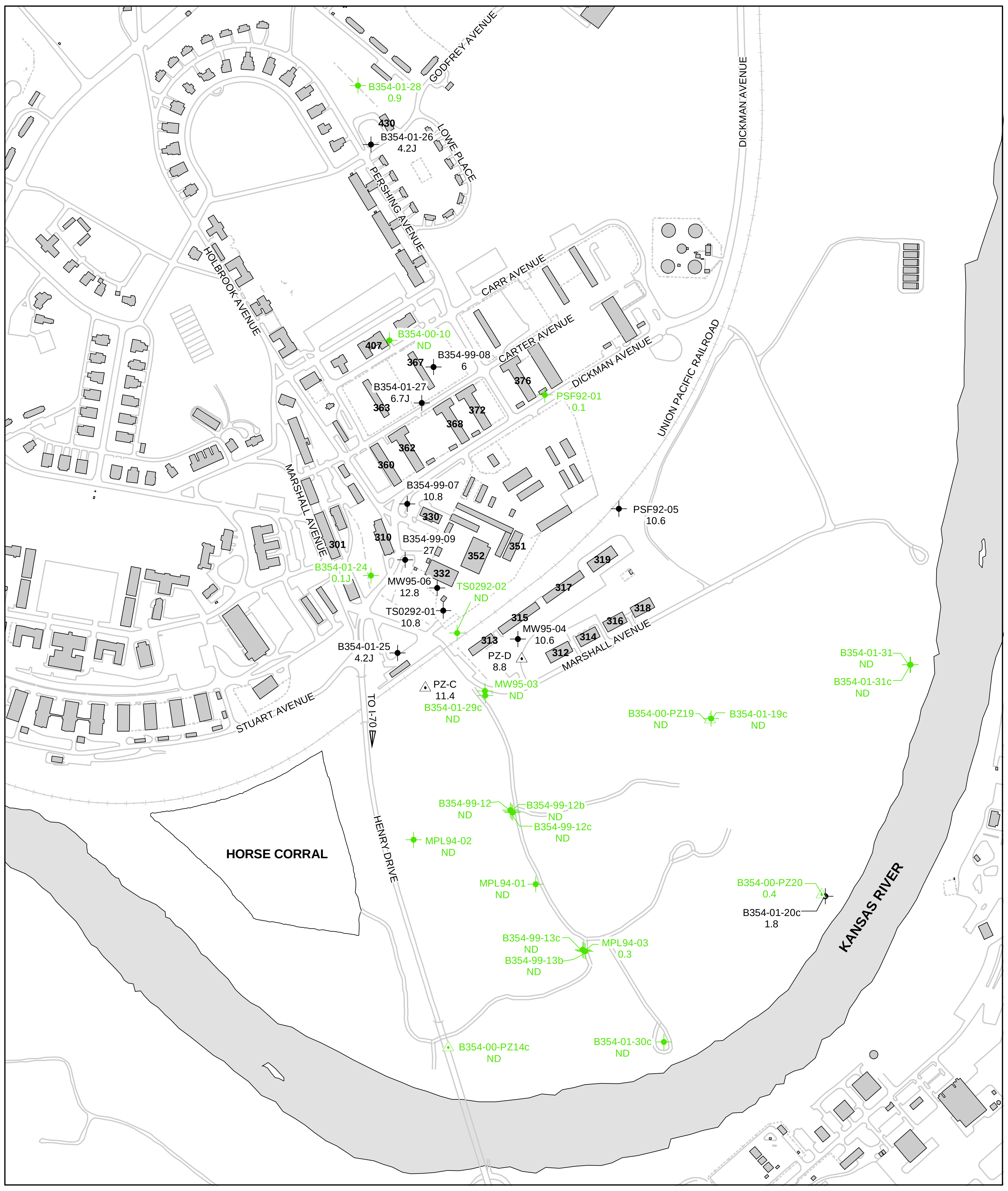
Burns & McDonnell
SINCE 1898

Figure 6-3

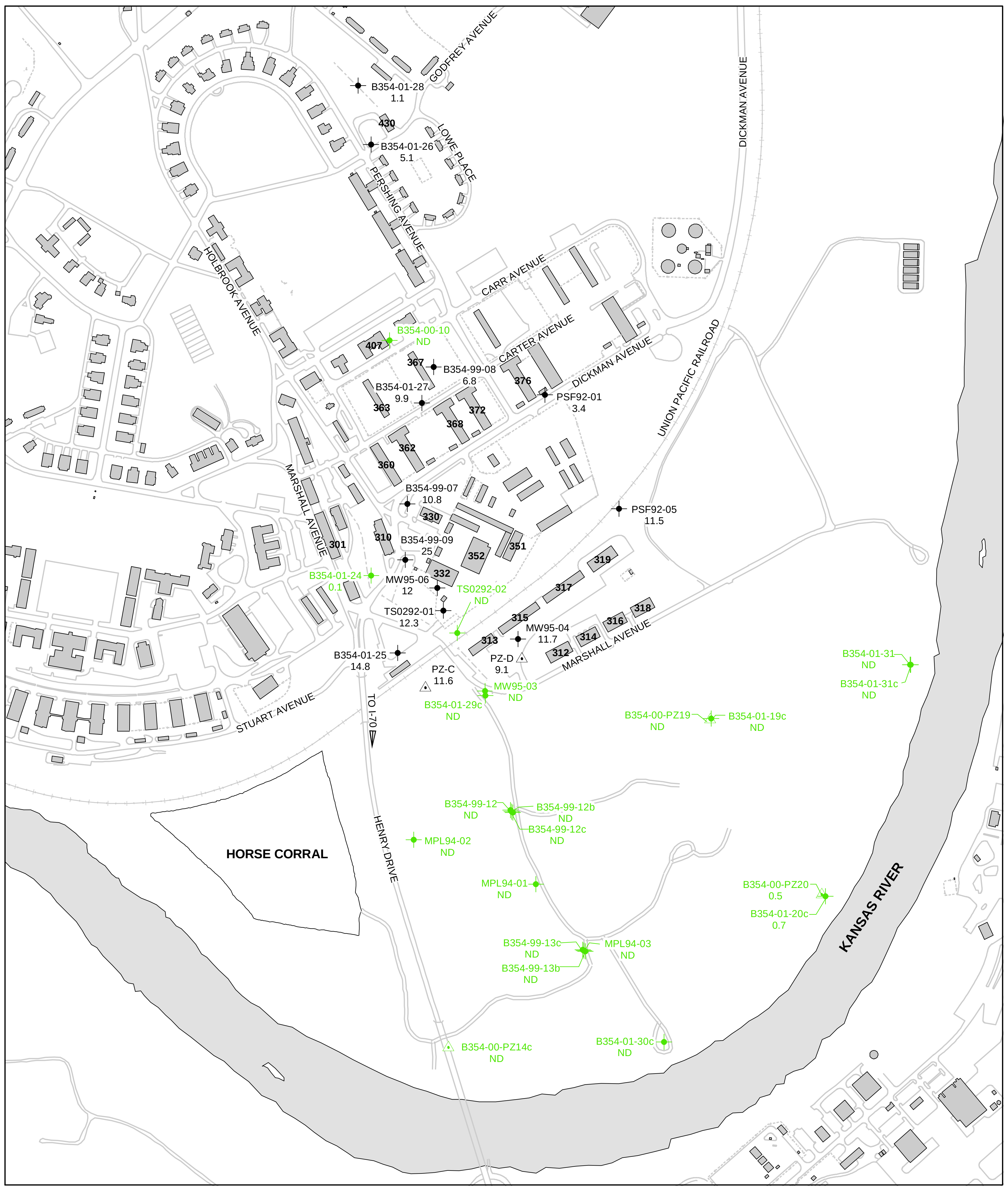
NATURAL ATTENUATION
FERROUS IRON
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

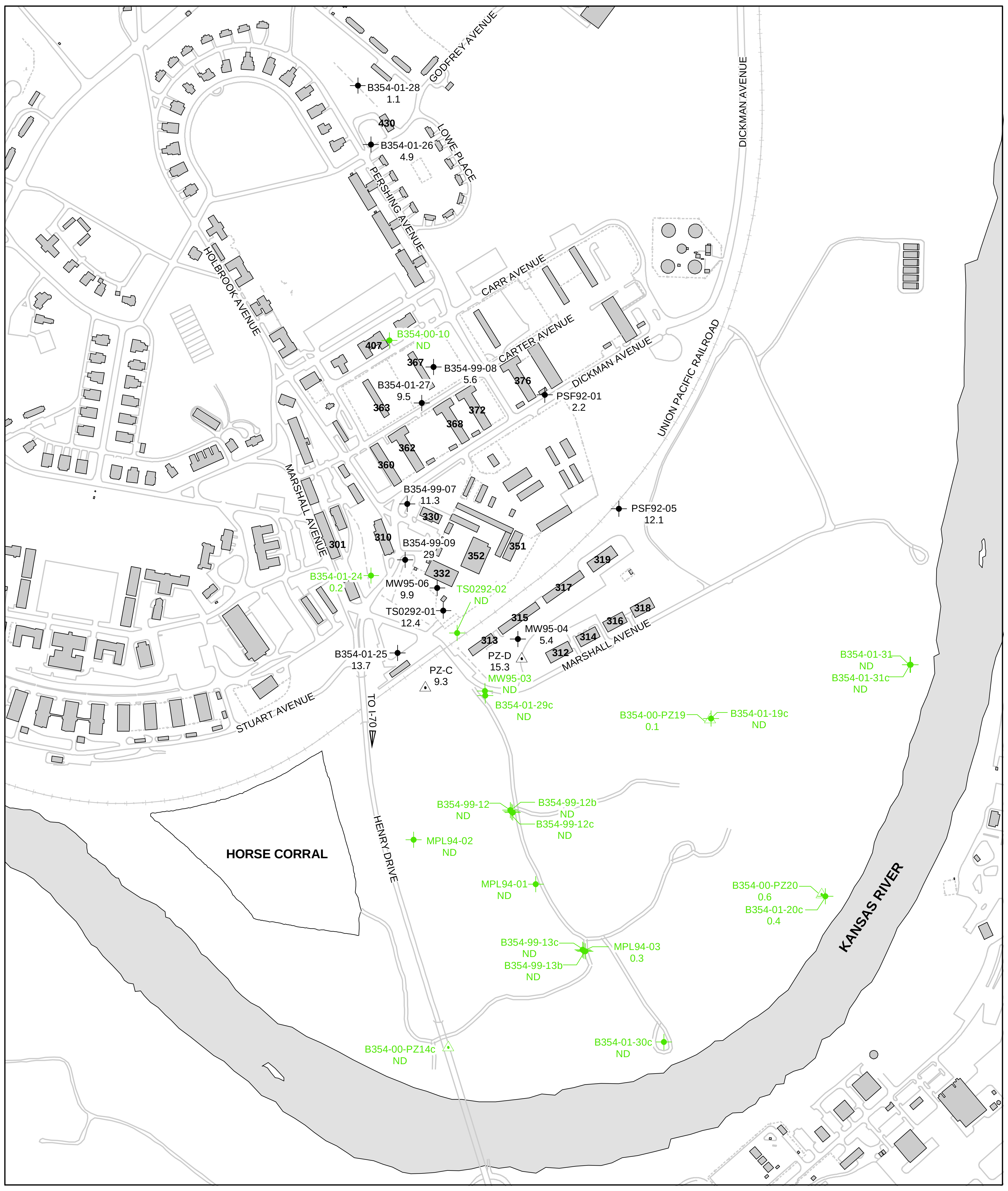
U:\armycorp\Projects\b354\ARC\ArcDocs\RI Report\Fig6-3nat atten iron.mxd cjl el 01/08/03



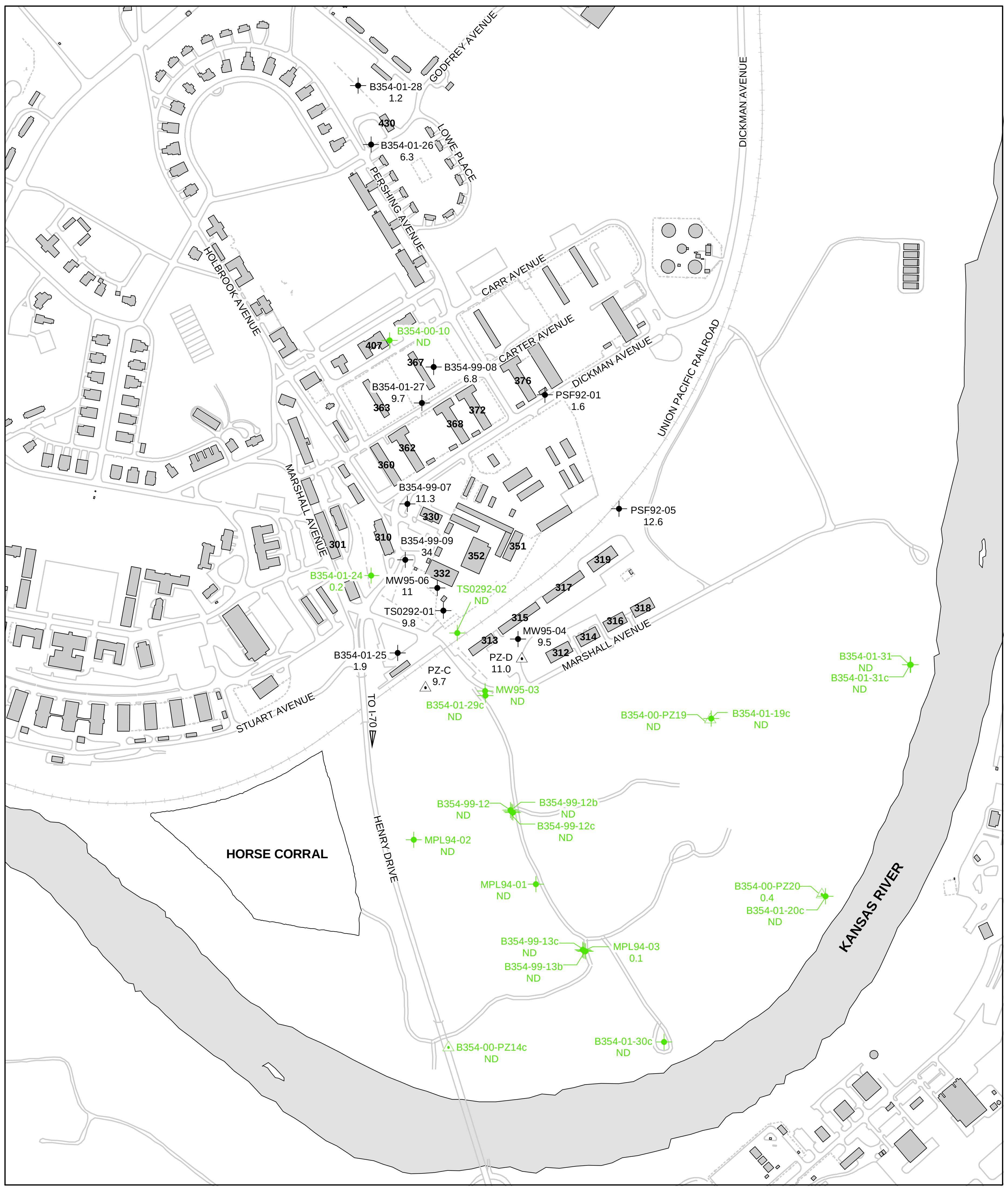
Fall 2001 (Favorable Geochemical Condition < 1 mg/L)



Winter 2002 (Favorable Geochemical Condition < 1 mg/L)



Spring 2002 (Favorable Geochemical Condition < 1 mg/L)



Summer 2002 (Favorable Geochemical Condition < 1 mg/L)

LEGEND

- Monitoring Well (Favorable)
- Piezometer (Favorable)
- Monitoring Well (Not Favorable)
- Monitoring Well (Not Favorable)
- Road or Parking Lot
- Fence
- Railroad
- Drainage Ditch
- ▨ Current Building

NOTES:

1. mg/L - milligrams per liter
2. J - Qualified as estimated
3. ND - Not Detected

NORTH

500 0 500 Feet

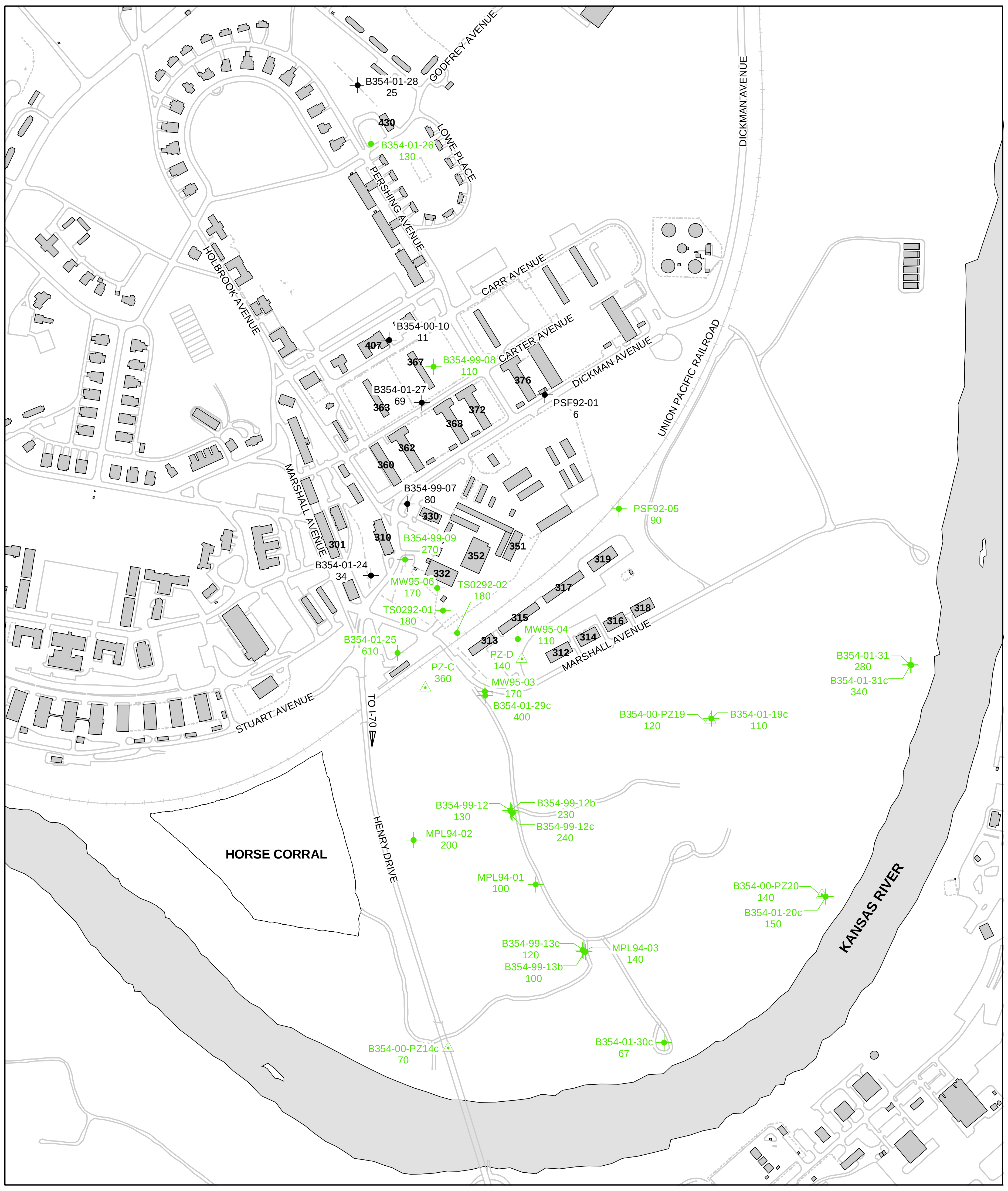
Burns & McDonnell
SINCE 1898

Figure 6-4

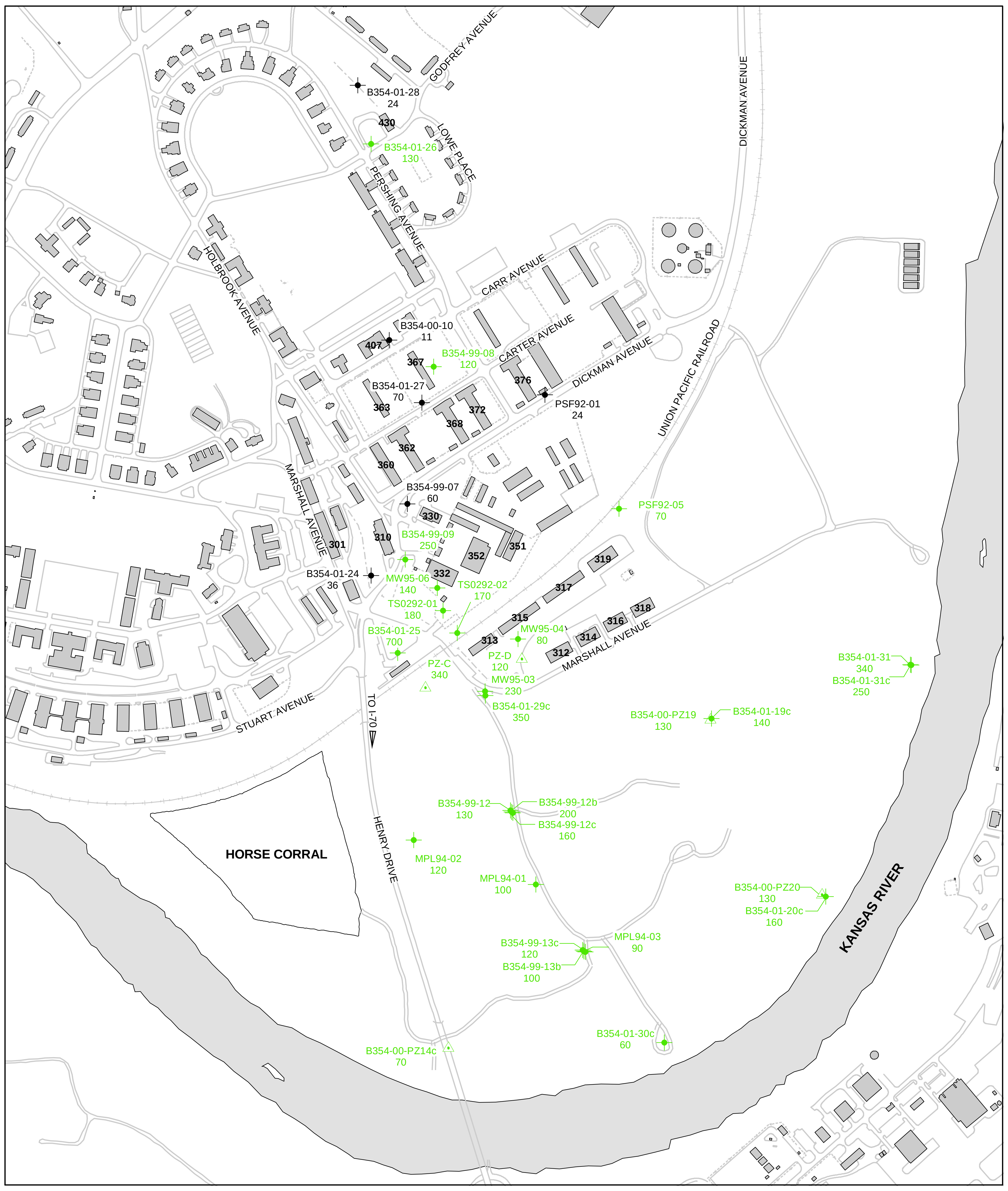
NATURAL ATTENUATION
NITRATE, as N
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

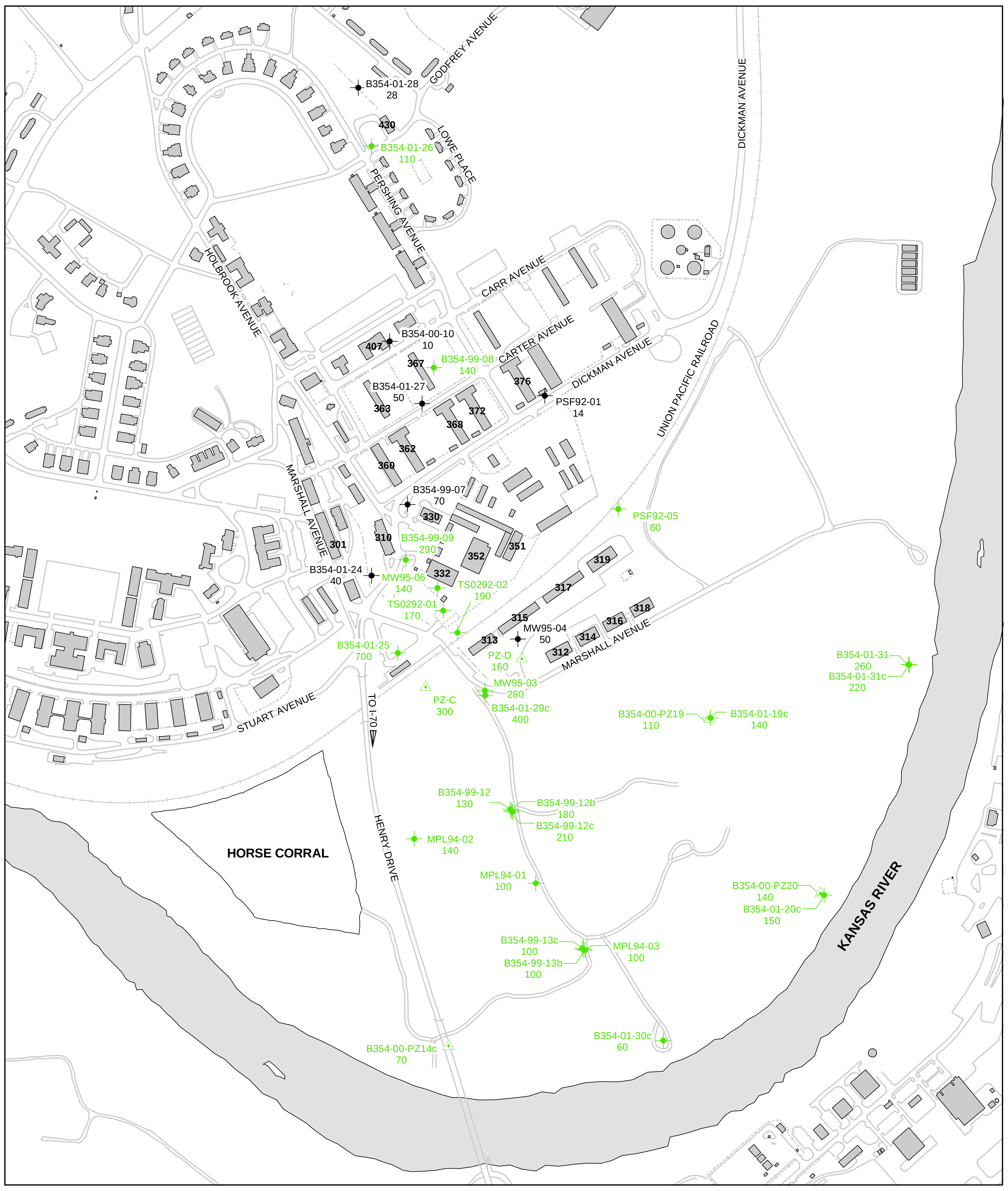
U:\armycorp\Projects\b354\ARC\ArcDocs\RI_Report\Fig6-4nat_atten_nitrate.mxd cjl el 12/05/02



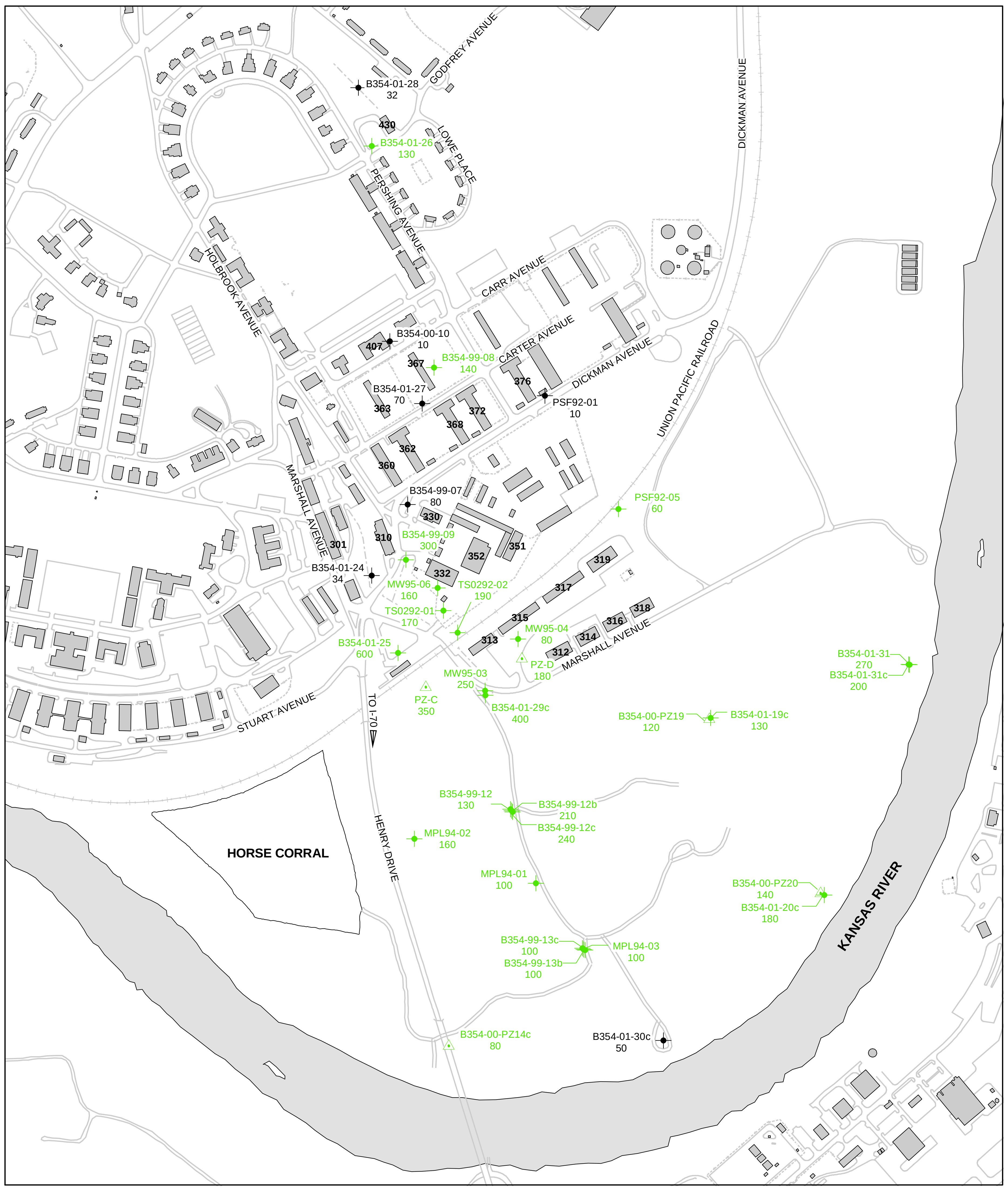
Fall 2001 (Favorable Geochemical Condition > 56 mg/L [alluvial] or 86 mg/L [terrace])



Winter 2002 (Favorable Geochemical Condition > 56 mg/L [alluvial] or 86 mg/L [terrace])



Spring 2002 (Favorable Geochemical Condition > 56 mg/L [alluvial] or 86 mg/L [terrace])



Summer 2002 (Favorable Geochemical Condition > 56 mg/L [alluvial] or 86 mg/L [terrace])

LEGEND

- Monitoring Well (Favorable)
- Piezometer (Favorable)
- Monitoring Well (Not Favorable)
- Monitoring Well (Not Favorable)

Road or Parking Lot
Fence
Railroad
Drainage Ditch
Current Building

NOTE:

1. mg/L - milligrams per liter

NORTH

500 0 500 Feet

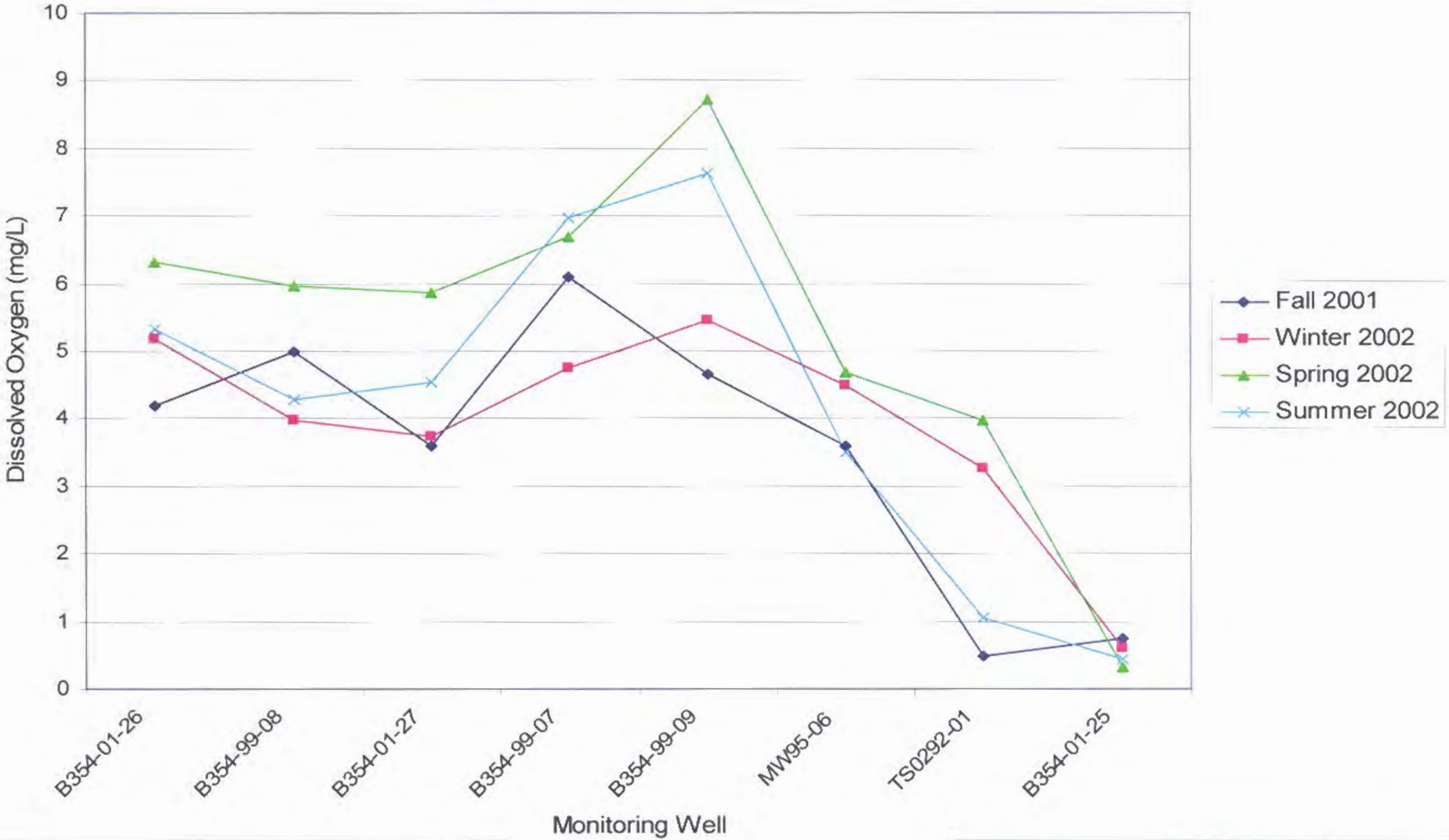
Burns & McDonnell
SINCE 1898

Figure 6-5

NATURAL ATTENUATION
CHLORIDE
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

U:\armycorp\Projects\b354\ARC\ArcDocs\RI Report\Fig6-5nat atten chloride.mxd cgb el 12/02/02



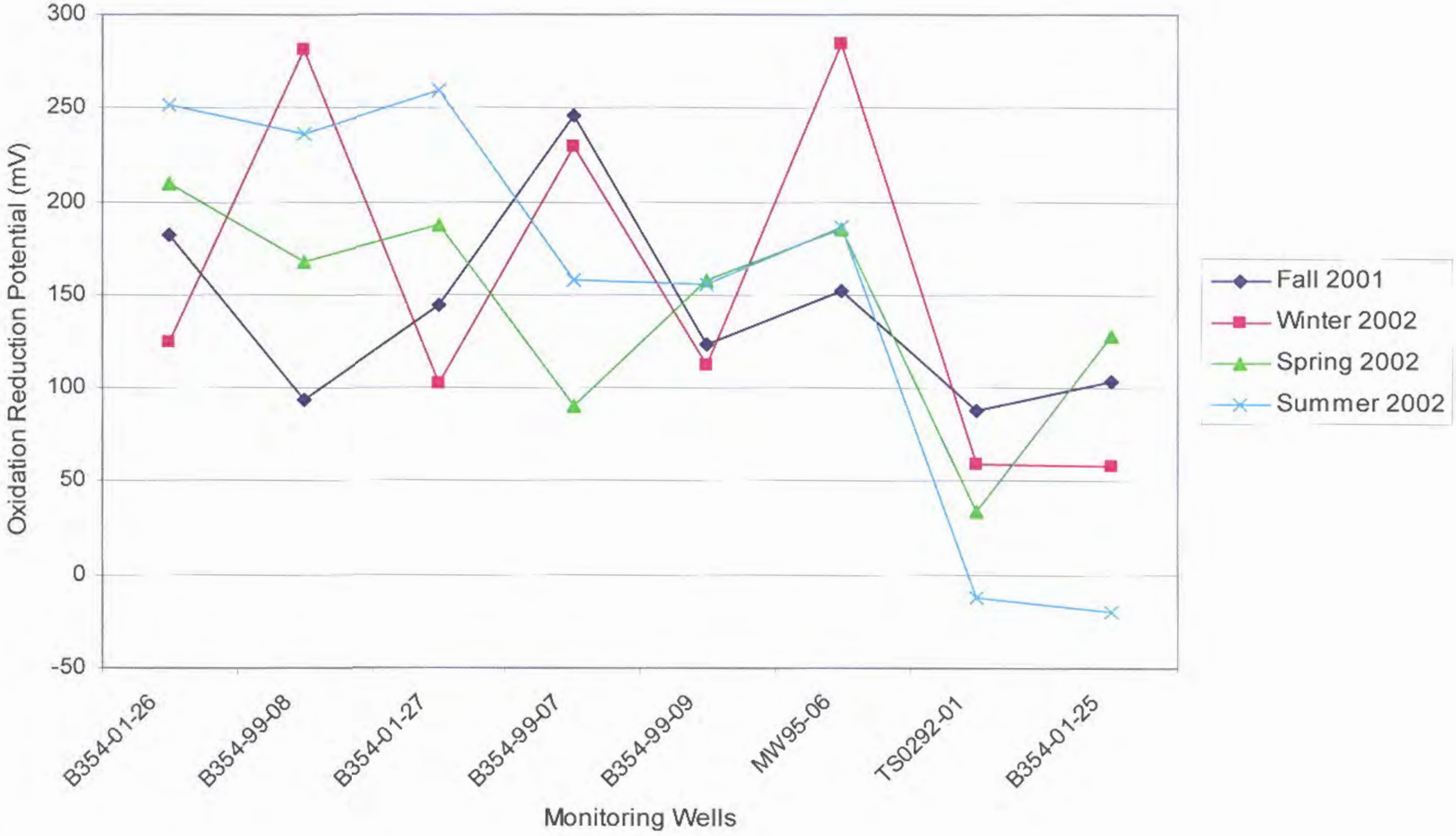
NOTES:

1. Graph presents dissolved oxygen trends along flowpath in the terrace aquifer (from left to right).
2. Dissolved oxygen values less than 0.5 milligrams per liter (mg/L) favorable for natural attenuation.

Burns & McDonnell
SINCE 1898

FIGURE 6-6A
NATURAL ATTENUATION
PARAMETER TRENDS
DISSOLVED OXYGEN - TERRACE AQUIFER
RI REPORT
354 AREA SOLVENT DETECTIONS
FORT RILEY, KANSAS

u:/armycorp/projects/b354/arc/arcdocs/ri_report/Fig6-6a_DO_NA_Terr_Graph.mxd cjl el 01/09/03



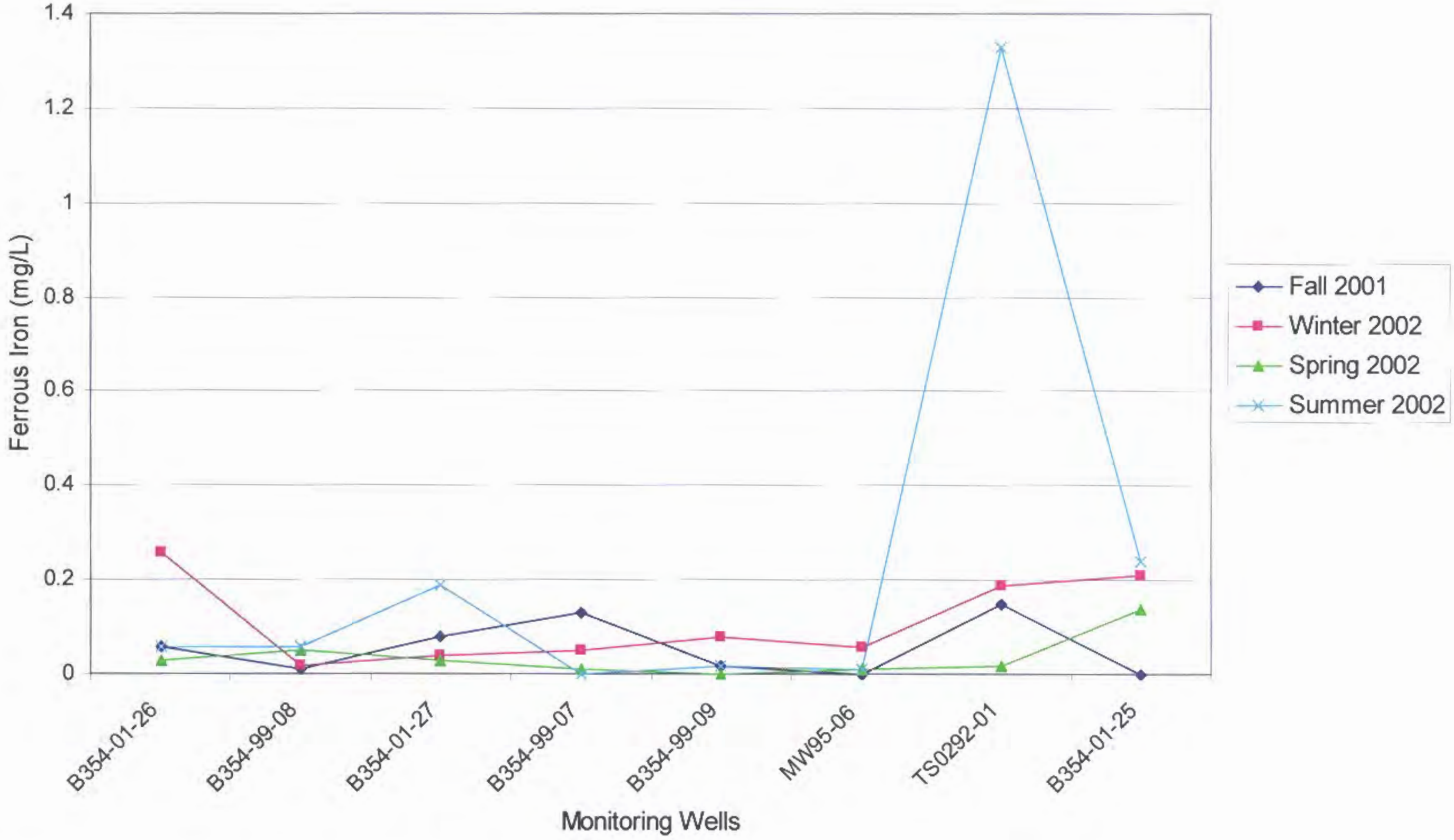
NOTES:

1. Graph presents oxygen reduction potential trends along flowpath in the terrace aquifer (from left to right).
2. Oxygen reduction potential values less than 50 millivolts (mV) favorable for natural attenuation.

Burns & McDonnell
SINCE 1898

FIGURE 6-6B
NATURAL ATTENUATION
PARAMETER TRENDS
OXYGEN REDUCTION POTENTIAL -
TERRACE AQUIFER
RI REPORT
354 AREA SOLVENT DETECTIONS
FORT RILEY, KANSAS

u:/armycorp/projects/b354/arc/arcdocs/ri report/Fig6-6b ORP NA Terr Graph.mxd cjl el 01/09/03



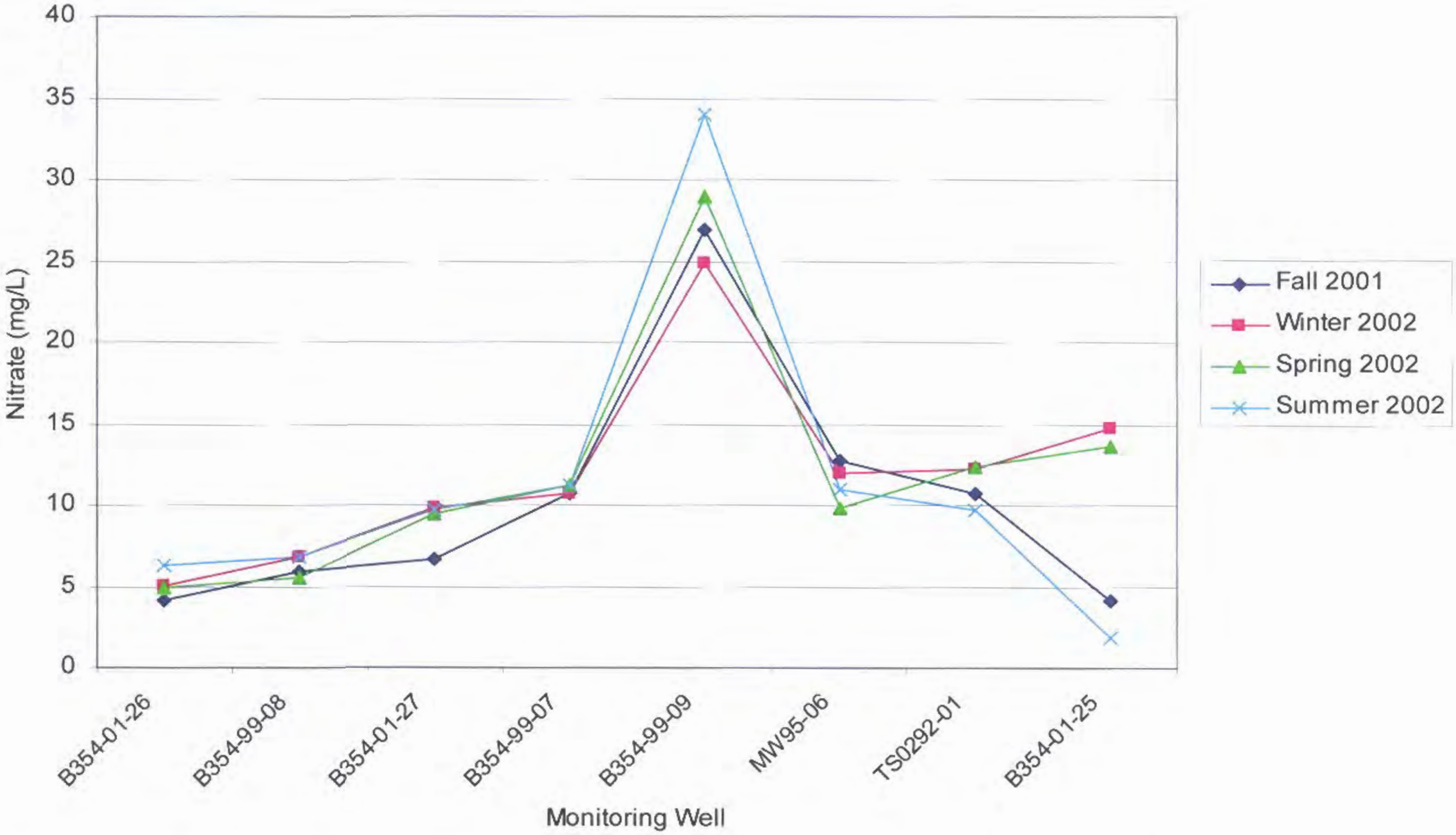
NOTES:

1. Graph presents ferrous iron trends along flowpath in the terrace aquifer (from left to right).
2. Ferrous iron concentrations greater than 1.0 milligrams per liter (mg/L) favorable for natural attenuation.

Burns & McDonnell
SINCE 1898

FIGURE 6-6C
NATURAL ATTENUATION
PARAMETER TRENDS
FERROUS IRON - TERRACE AQUIFER
RI REPORT
354 AREA SOLVENT DETECTIONS
FORT RILEY, KANSAS

u:/armycorp/projects/b354/arc/arcdocs/ri report/Fig6-6c Iron NA Terr Graph.mxd cil el 01/09/03 u:/armycorp/projects/b354/arc/arcdocs/ri report/Fig6-6d NIT NA Terr Graph.mxd cil el 01/09/03

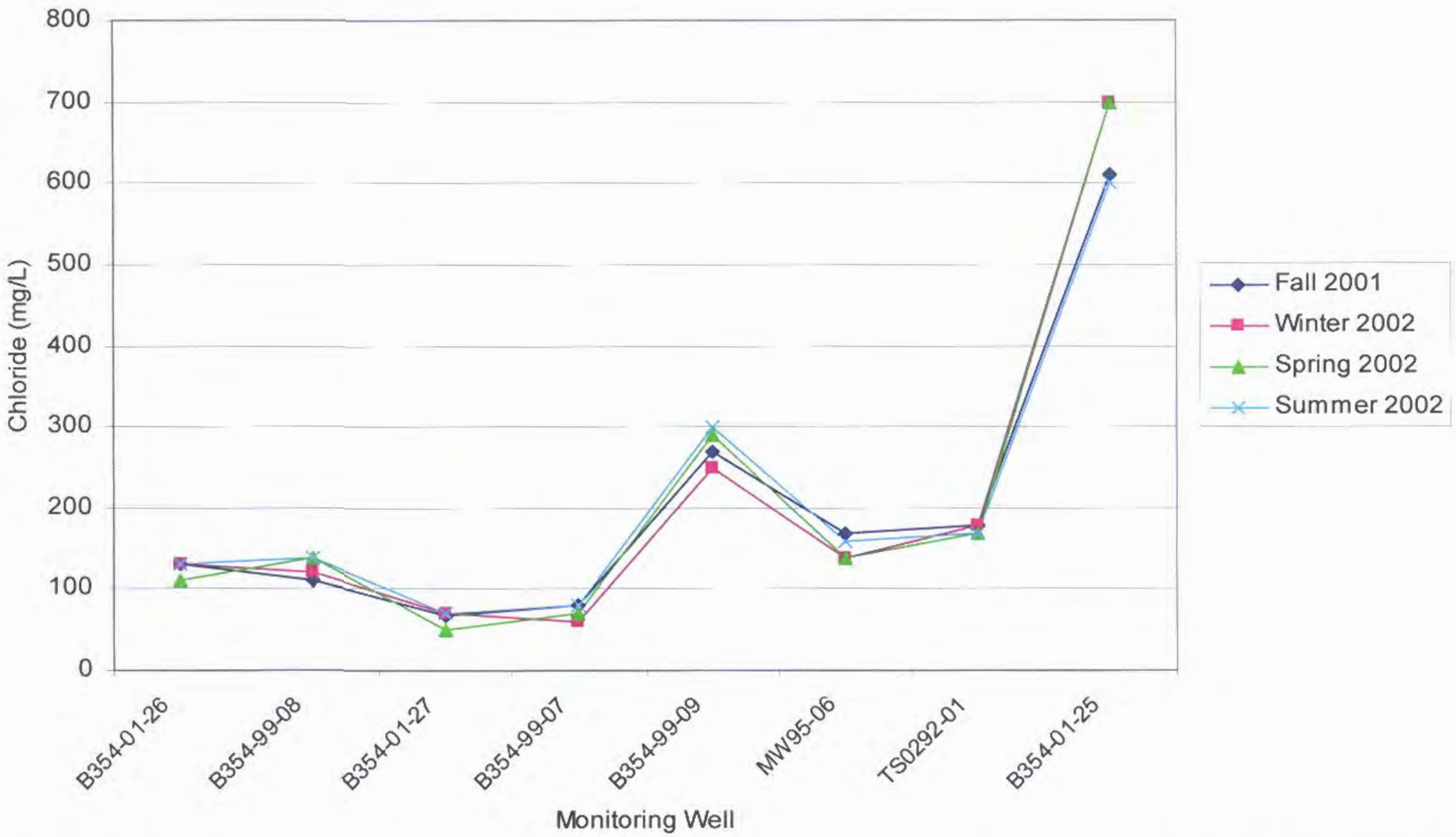


NOTES:

1. Graph presents nitrate trends along flowpath in the terrace aquifer (from left to right).
2. Nitrate concentrations less than 1.0 milligrams per liter (mg/L) favorable for natural attenuation.

Burns & McDonnell
SINCE 1898

FIGURE 6-6D
NATURAL ATTENUATION
PARAMETER TRENDS
NITRATE - TERRACE AQUIFER
RI REPORT
354 AREA SOLVENT DETECTIONS
FORT RILEY, KANSAS



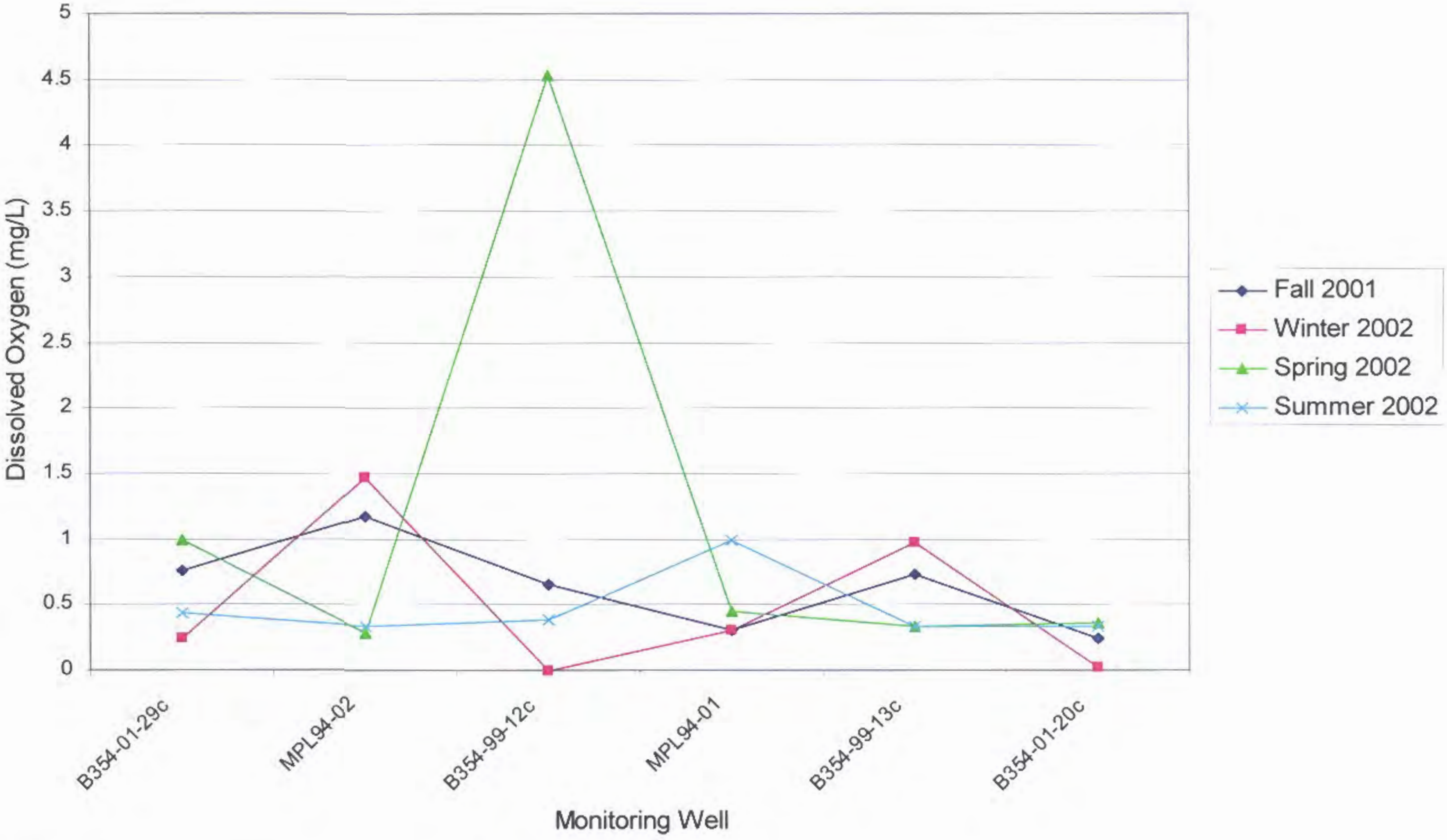
NOTES:

1. Graph presents chloride trends along flowpath in the terrace aquifer (from left to right).
2. Chloride concentrations greater than 86 milligrams per liter (mg/L) favorable for natural attenuation.

Burns & McDonnell
SINCE 1898

FIGURE 6-6E
NATURAL ATTENUATION
PARAMETER TRENDS
CHLORIDE - TERRACE AQUIFER
RI REPORT
354 AREA SOLVENT DETECTIONS
FORT RILEY, KANSAS

u:/armycorp/projects/b354/arc/arcdocs/ri report/Fig6-6e Chlor NA Terr Graph.mxd cil el 01/09/03



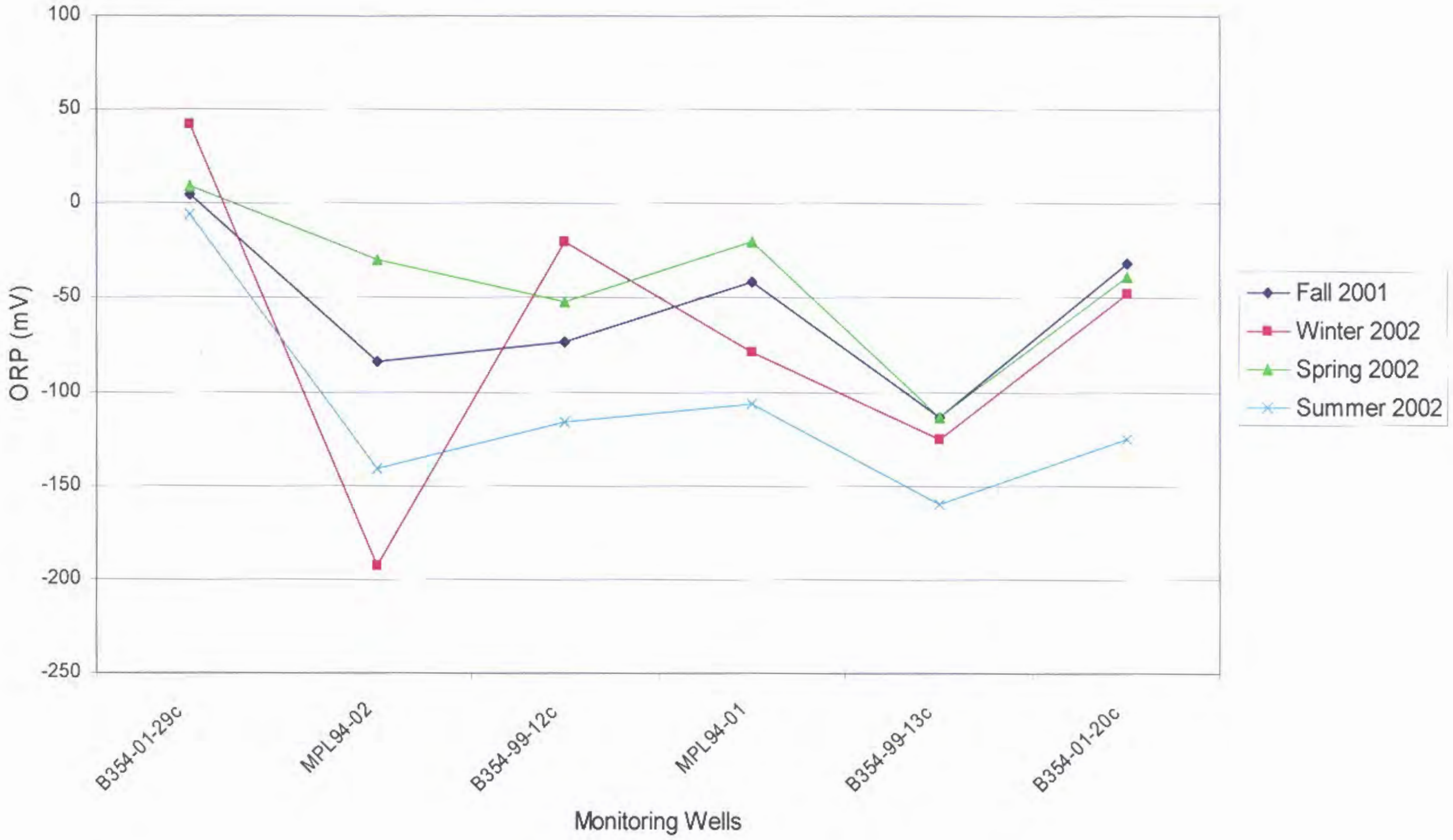
u:/armycorp/projects/b354/arc/arcdocs/ri report/Fig6-6f DO NA All Graph.mxd cil el 01/09/03

NOTES:

1. Graph presents dissolved oxygen trends along flowpath in the Kansas River alluvial aquifer (from left to right).
2. Dissolved oxygen values less than 0.5 milligrams per liter (mg/L) favorable for natural attenuation.

Burns & McDonnell
SINCE 1898

FIGURE 6-6F
NATURAL ATTENUATION
PARAMETER TRENDS
DISSOLVED OXYGEN - ALLUVIAL AQUIFER
RI REPORT
354 AREA SOLVENT DETECTIONS
FORT RILEY, KANSAS



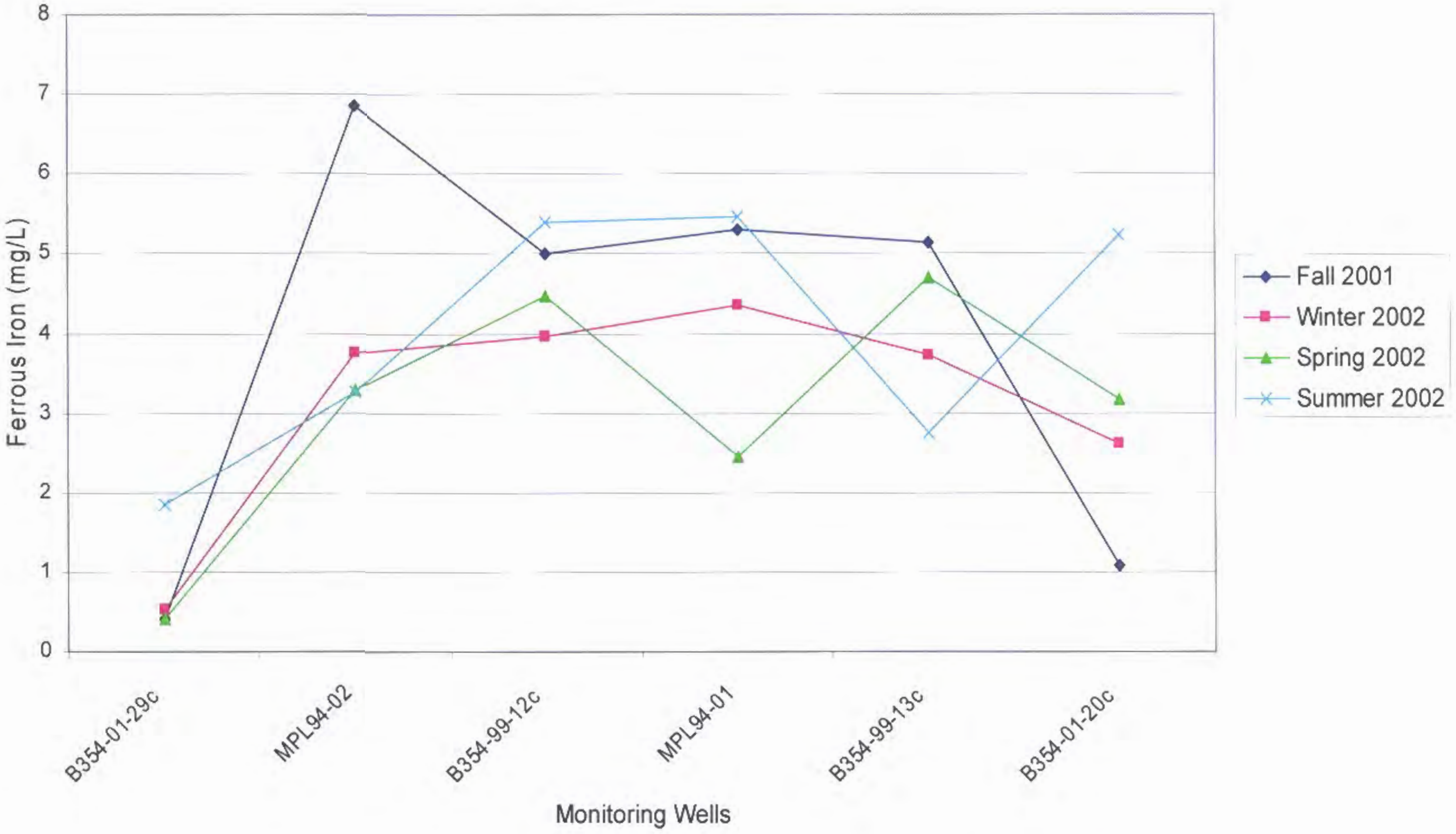
NOTES:

1. Graph presents oxygen reduction potential trends along flowpath in the Kansas River alluvial aquifer (from left to right).
2. Oxygen reduction potential values less than 50 millivolts (mV) favorable for natural attenuation.

Burns & McDonnell
SINCE 1898

FIGURE 6-6G
NATURAL ATTENUATION
PARAMETER TRENDS
OXYGEN REDUCTION POTENTIAL -
ALLUVIAL AQUIFER
RI REPORT
354 AREA SOLVENT DETECTIONS
FORT RILEY, KANSAS

u:/armycorp/projects/b354/arc/arcdocs/ri report/Fig6-6g ORP NA All Graph.mxd cil el 01/09/03



NOTES:

1. Graph presents ferrous iron trends along flowpath in the Kansas River alluvial aquifer (from left to right).
2. Ferrous iron concentrations greater than 1.0 milligrams per liter (mg/L) favorable for natural attenuation.

Burns & McDonnell
SINCE 1898

FIGURE 6-6H
NATURAL ATTENUATION
PARAMETER TRENDS
FERROUS IRON - ALLUVIAL AQUIFER
RI REPORT
354 AREA SOLVENT DETECTIONS
FORT RILEY, KANSAS

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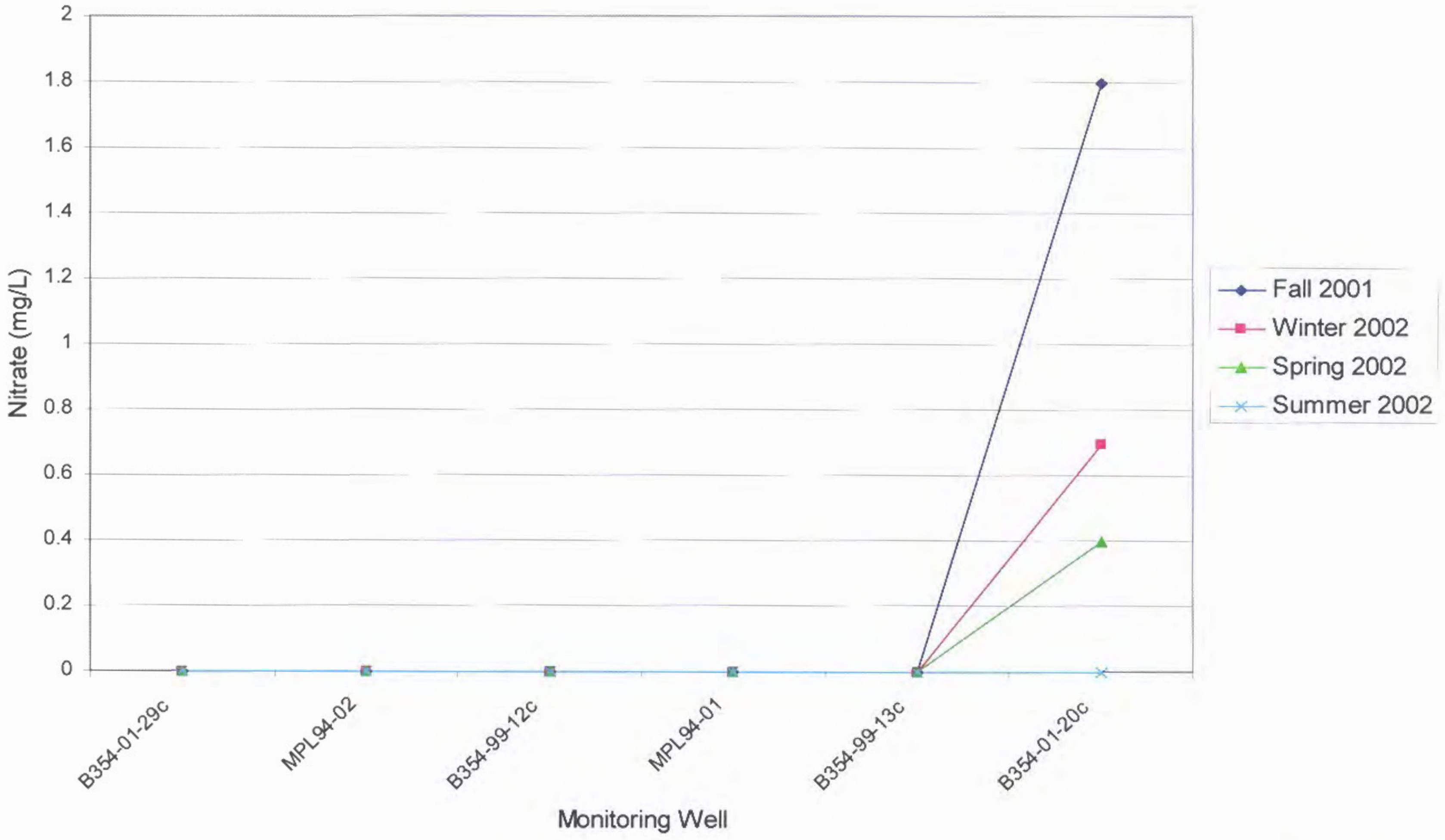
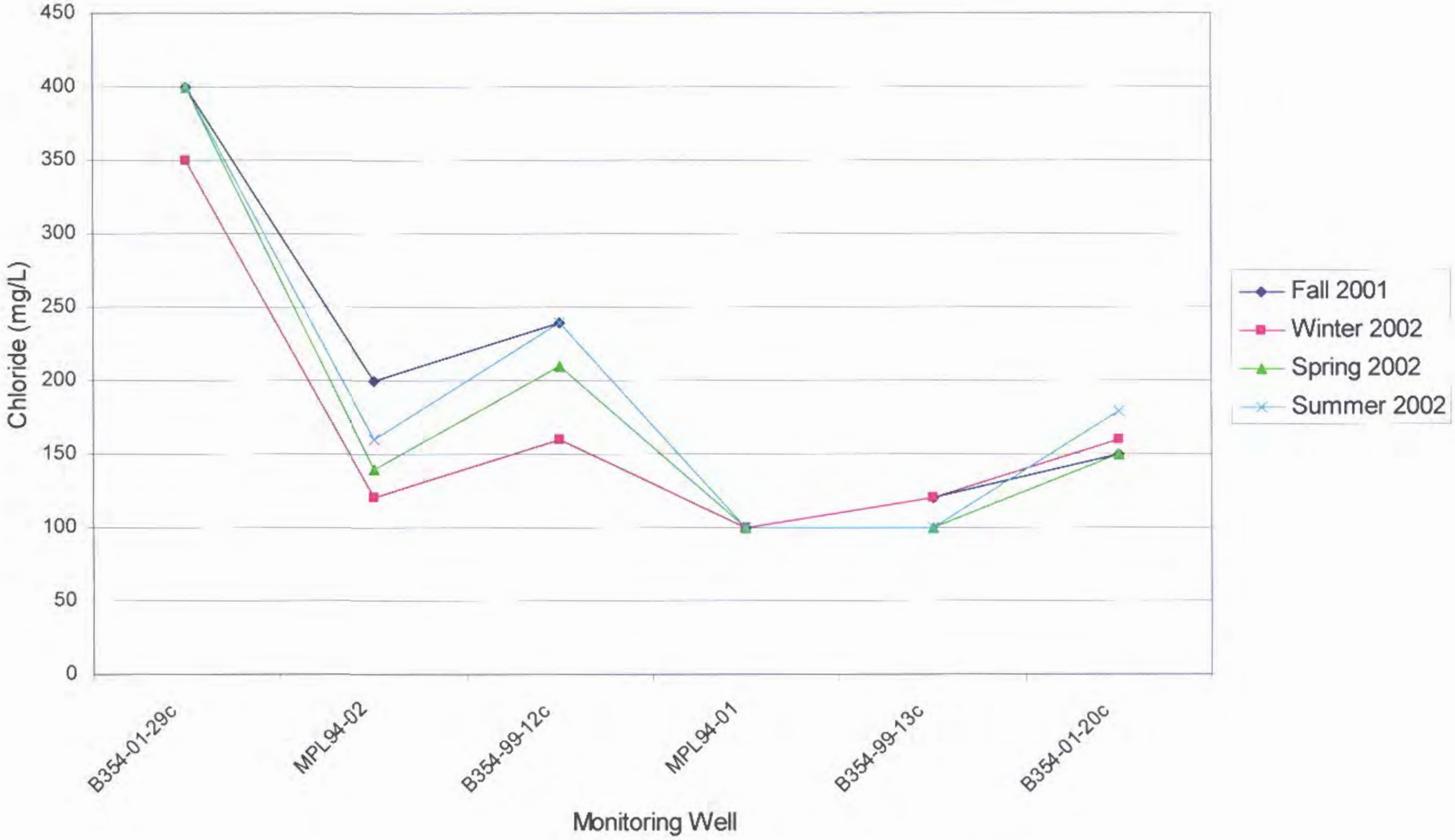


NOTES:

1. Graph presents nitrate trends along flowpath in the Kansas River alluvial aquifer (from left to right).
2. Nitrate concentrations less than 1.0 milligrams per liter (mg/L) favorable for natural attenuation.

Burns & McDonnell
SINCE 1898

FIGURE 6-6I
NATURAL ATTENUATION
PARAMETER TRENDS
NITRATE - ALLUVIAL AQUIFER
RI REPORT
354 AREA SOLVENT DETECTIONS
FORT RILEY, KANSAS

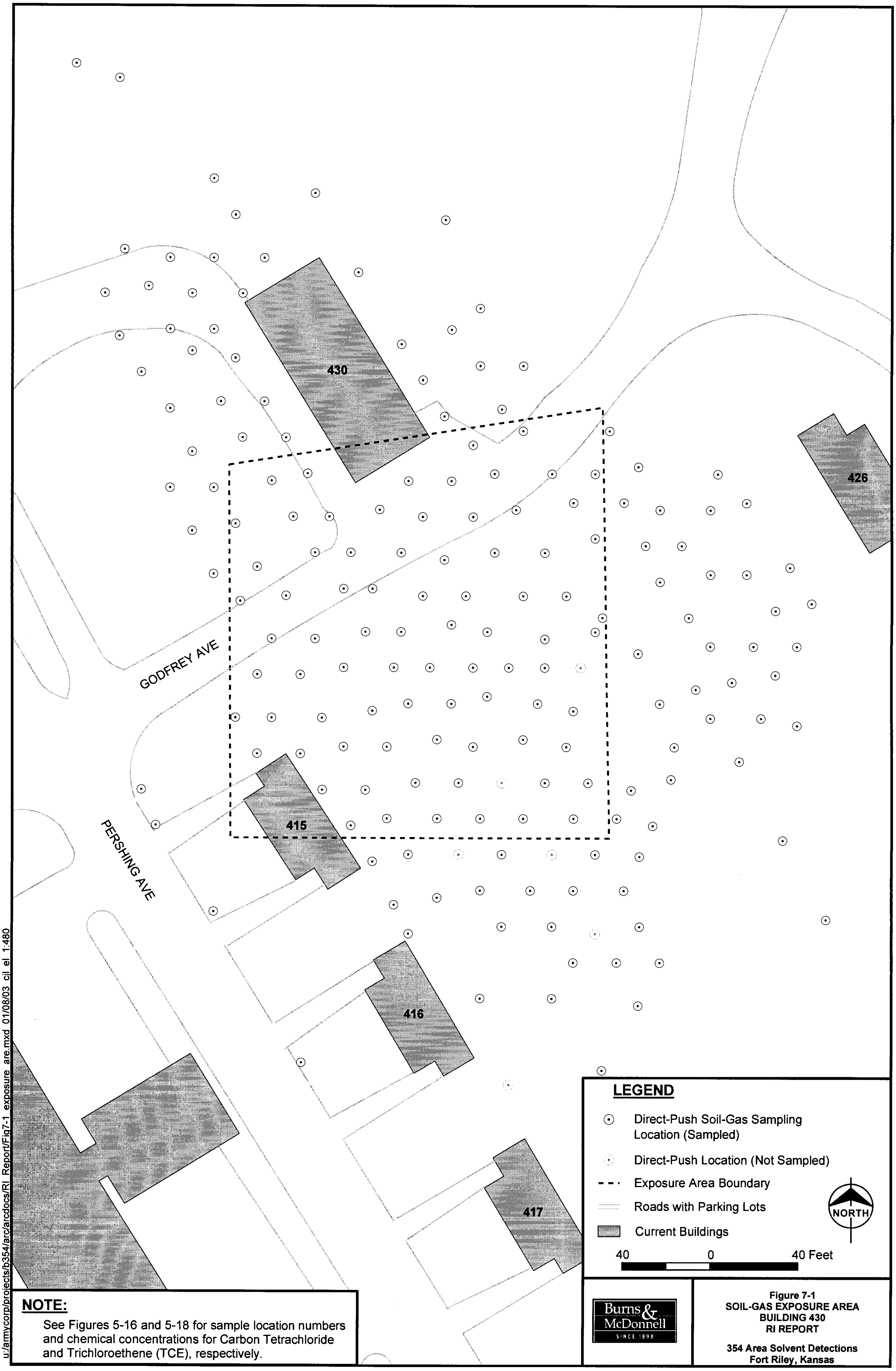


NOTES:

1. Graph presents chloride trends along flowpath in the Kansas River alluvial aquifer (from left to right).
2. Chloride concentrations greater than 56 milligrams per liter (mg/L) favorable for natural attenuation.

Burns & McDonnell
SINCE 1898

FIGURE 6-6J
NATURAL ATTENUATION
PARAMETER TRENDS
CHLORIDE - ALLUVIAL AQUIFER
RI REPORT
354 AREA SOLVENT DETECTIONS
FORT RILEY, KANSAS



LEGEND

⊙ Direct-Push Soil-Gas Sampling Location (Sampled)

· Direct-Push Location (Not Sampled)

- - - Exposure Area Boundary

Roads with Parking Lots

▨ Current Buildings

NOTE:

See Figures 5-16 and 5-18 for sample location numbers and chemical concentrations for Carbon Tetrachloride and Trichloroethene (TCE), respectively.

Burns & McDonnell
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Figure 7-1
SOIL-GAS EXPOSURE AREA
BUILDING 430
RI REPORT

354 Area Solvent Detections
Fort Riley, Kansas

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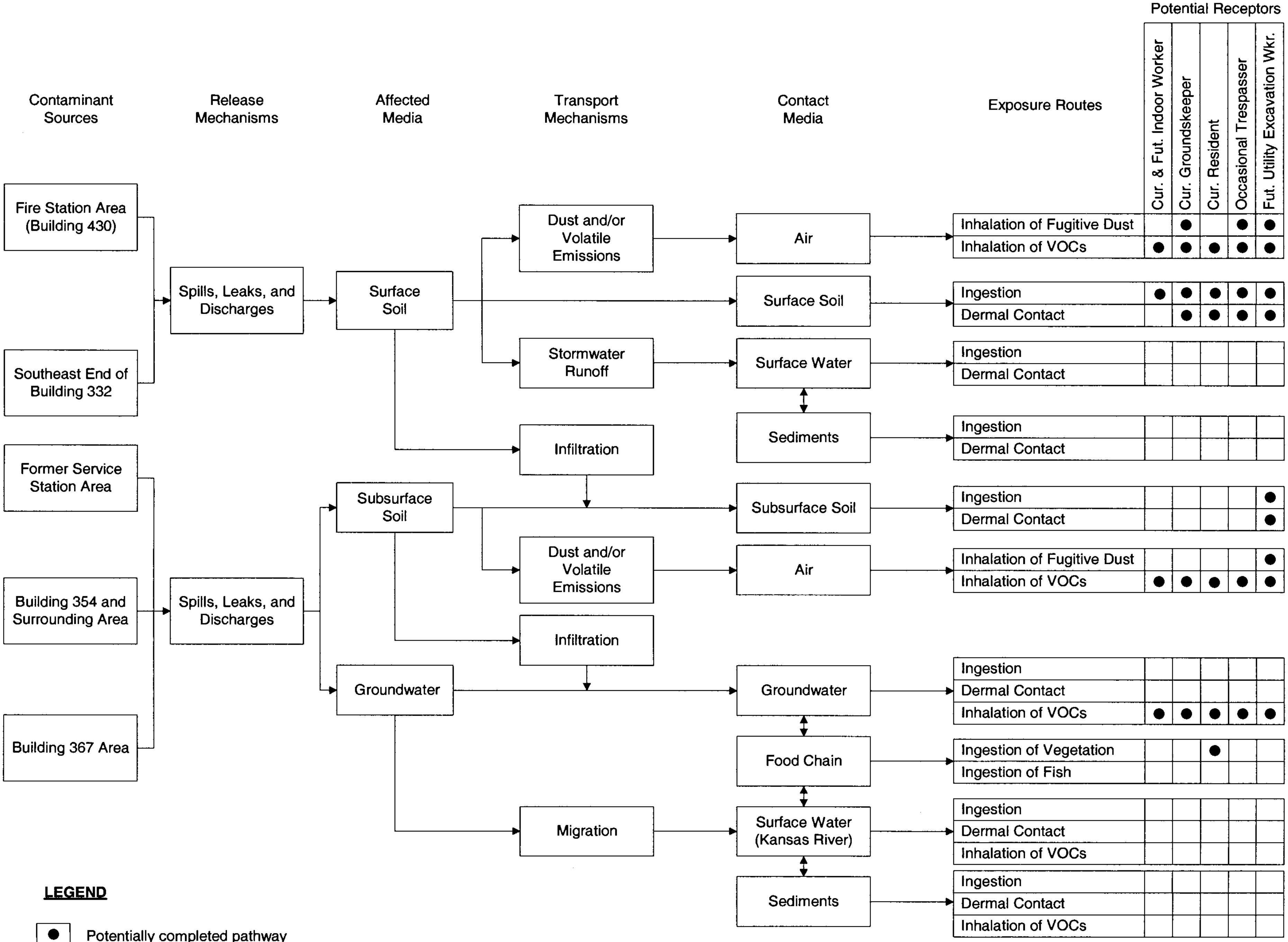

Contact Media	Exposure Routes	Cur. & Fut. Indoor Worker	Cur. Groundskeeper	Cur. Resident	Occasional Trespasser	Fut. Utility Excavation Wkr.
Air	Inhalation of Fugitive Dust		●		●	●
	Inhalation of VOCs	●	●	●	●	●
Surface Soil	Ingestion	●	●	●	●	●
	Dermal Contact		●	●	●	●
Surface Water	Ingestion					
	Dermal Contact					
Sediments	Ingestion					
	Dermal Contact					
Subsurface Soil	Ingestion					●
	Dermal Contact					●
Air	Inhalation of Fugitive Dust					●
	Inhalation of VOCs	●	●	●	●	●
Groundwater	Ingestion					
	Dermal Contact					
	Inhalation of VOCs	●	●	●	●	●
Food Chain	Ingestion of Vegetation			●		
	Ingestion of Fish					
Surface Water (Kansas River)	Ingestion					
	Dermal Contact					
	Inhalation of VOCs					
Sediments	Ingestion					
	Dermal Contact					
	Inhalation of VOCs					

LEGEND

● Potentially completed pathway

☐ Not a completed pathway

VOC = Volatile Organic Compound

4/30/2003 k:\27828\Hhcsm1.vsd

Burns & McDonnell
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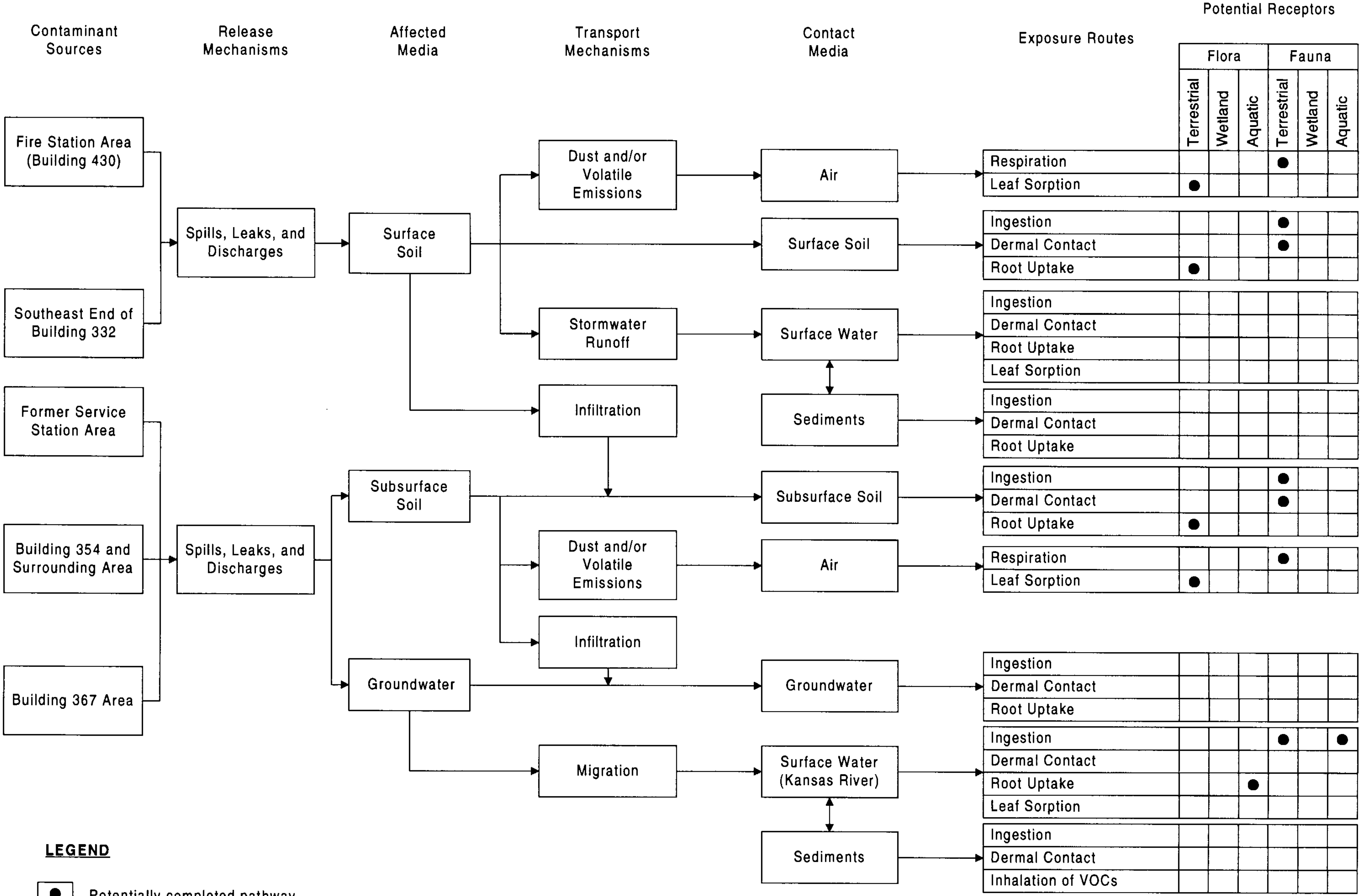
Figure 7-2
Human Health Conceptual Model
354 Area Solvent Detections
Fort Riley, KS



Contact Media	Exposure Routes	Flora: Terrestrial	Flora: Wetland	Flora: Aquatic	Fauna: Terrestrial	Fauna: Wetland	Fauna: Aquatic
Air	Respiration				●		
	Leaf Sorption	●					
Surface Soil	Ingestion				●		
	Dermal Contact				●		
	Root Uptake	●					
Surface Water	Ingestion						
	Dermal Contact						
	Root Uptake						
	Leaf Sorption						
Sediments	Ingestion						
	Dermal Contact						
	Root Uptake						
Subsurface Soil	Ingestion				●		
	Dermal Contact				●		
	Root Uptake	●					
Air	Respiration				●		
	Leaf Sorption	●					
Groundwater	Ingestion						
	Dermal Contact						
	Root Uptake						
Surface Water (Kansas River)	Ingestion				●		●
	Dermal Contact						
	Root Uptake			●			
	Leaf Sorption						
Sediments	Ingestion						
	Dermal Contact						
	Inhalation of VOCs						

LEGEND

● Potentially completed pathway

☐ Not a completed pathway

VOC = Volatile Organic Compound

Burns & McDonnell
SINCE 1898

Figure 8-1
Ecological Conceptual Model
354 Area Solvent Detections
Fort Riley, KS

4/30/2003 k:\27828\csmeco.vsd

Burns &
McDonnell
SINCE 1898

November 7, 2003

Directorate of Environment & Safety
ATTN: AFZN-ES-OM (Shields)
407 Pershing Court
Fort Riley, KS 66442-6016

Draft Final Remedial Investigation Report
354 Area Solvent Detections
Fort Riley, Kansas
BMcD Project No. 27828
Contract No. DACA41-96-D-8010 Task Order #0036

Dr. Shields:

Enclosed are two copies of the Draft Final Remedial Investigation (RI) Report (including Appendices) for the above referenced site in PDF format on CD-ROM. Also find enclosed a copy of the distribution list.

If you have any questions, please call me at (816) 822-3595.

Sincerely,

E. D. Lindgren
Project Manager

EDL/shields.doc

Enclosures

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