RISK-BASED CORRECTIVE ACTION REPORT

Boeing Tract 1, St. Louis, Missouri

September 2004

Volume 1

Prepared for:

The Boeing Company

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Airport	Lambert St. Louis International Airport
AST	Aboveground Storage Tank
ATV	All Terrain Vehicle
bgs	below ground surface
BNI	Bechtel National, Incorporated
BTEX	Benzene, Toluene, Ethylbenzene, and total Xylenes
CALM	Cleanup Levels for Missouri
cm/sec	centimeters per second
cm^2/sec	centimeters squared per second
CMS	Corrective Measures Study
COCs	constituents of concern
4°C	degrees Celsius
4°F	degrees Fahrenheit
DL	Detection Limit
DO	Dissolved Oxygen
DQL	Data Quality Level
DQO	Data Quality Objective
DRO	Diesel Range Organics
EAs	Environmental Assessments
EM	Exposure Model
ESA	Environmental Site Assessment
Facility	Boeing Tract 1 facility
FS	Feasibility Study
ft/ft	feet per foot
FUSRAP	Formerly Utilized Sites Remedial Action Program
GRO	Gasoline Range Organics
HDPE	High Density Polyethylene
HI	Hazard Index
HISS	Hazelwood Interim Storage Site
HRC	Hydrogen Release Compound
HSA	Hollow-Stem Auger
HWP	Hazardous Waste Program
HZ	Hydrostrastigraphic Zone
ID	Internal Diameter
IELCR	Individual Excess Lifetime Cancer Risk
ITLs	Investigative Threshold Levels
IWTP	Industrial Wastewater Treatment Plant
LNAPL	Light Non-Aqueous Phase Liquid
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDNR	Missouri Department of Natural Resources
MEK	Methyl Ethyl Ketone
μg/kg	micrograms per kilogram
μg/L	micrograms per liter
mg/L	milligrams per liter
MIBK	Methyl Isobutyl Ketone
MRBDM	Missouri Risk-Based Decision Making
MSD	Metropolitan St. Louis Sewer District

msl	mean sea level
MTBE	Methyl Tertiary-Butyl Ether
NPDES	National Pollutant Discharge Elimination System
OD	Outside Diameter
ORP	Redox Potential
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Byphenols
PCE	Perchloroethylene
PCOCs	Potential Chemicals of Concern
PID	Photoionization Detector
ppm	parts per million
PR	Preliminary Review
PRG	Preliminary Remediation Goal
PVC	Polyvinyl Chloride
RA	Risk Assessment
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SAIC	Science Applications International Corporation
SC	Specific Conductivity
SLAPS	St. Louis Airport Site
SWMUs	Solid Waste Management Units
TCE	Trichloroethene
TOV	Total Organic Volatiles
TPHs	Total Petroleum Hydrocarbons
USACE	U.S. Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
VSI	Visual Site Inspection

The Boeing Tract 1 Facility (Facility) is located in Hazelwood, St. Louis County, Missouri and covers a total area of 228 acres. The Facility includes several buildings used to service and manufacture aircraft, office buildings, parking lots, a coal fueled power plant, and a waste water treatment facility. The Facility included several underground storage tanks (USTs), above ground storage tanks (ASTs), and other waste handling areas.

Based on an investigation in 1995, 32 solid waste management units (SWMUs) were identified. Boeing has conducted numerous site investigations and remedial actions at the Facility. As a result of these, a large volume of data ~~has~~ have been collected. Data indicates that at various locations within the Facility soil and groundwater impacts have consisted of semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), total petroleum hydrocarbon (TPH), and metals.

To perform a risk evaluation, the site was divided into the following areas:

- Area 1 Runway Protection Zone: (includes former Buildings 40, 45L, 45C, 45D, 45E, and parts of 45 and 45K).

- Area 2 Demolished Area: (includes former Buildings 45J, 51, 52, 48, 48A, and part of 45K).

  - Sub-area 2A: Western portions of Buildings 45J, 51, and 52, northwestern corner of Building 45, northern portion of Building 45K, and parking lots, entrance road, and open space between these buildings and the west property line.
  - Sub-area 2B: Eastern portion of Buildings 45J, 51, and 52, northwestern portion of Building 45, western portions of Buildings 48 and 48A, smaller associated buildings, and associated parking lots and access areas.
  - Sub-area 2C: Eastern portions of Buildings 48 and 48A, northeastern portion of Building 45, smaller associated buildings, and associated parking lots and access areas.

- Area 3 Retained Area: (includes Buildings 42, 43, 45H, 41, 44, 44A, 46, 49, 1, 2, 3, and 4).

  - Sub-area 3A: Buildings/structures 44, 44A, 46, and 49, western portion of Building 41, northern edge of Building 42, and associated parking lots and access areas primarily to the west and south of these buildings.
  - Sub-area 3B: Small open area between Buildings 2 and 42 including the parking access area on the western side of Building 2.
  - Sub-area 3C: All but the northern edge of Building 42, several buildings/structures to the south of Building 42, and associated paved parking and access areas primarily to the east and south of these buildings to the runway on the south.
  - Sub-area 3D: Eastern portion of Buildings 41, northern half of Building 2, and the associated open and parking areas on the west side of

Building 2.

- Sub-area 3E: Small open area between Buildings 2 and 4 including parking and access areas.
- Sub-area 3F: Small rectangular area at the southwestern corner of Building 1, including parking and access areas and the southwest corner of Building 1.
- Sub-area 3G: Small rectangular area between Buildings 1, 2, and 3, including parking and access areas and the northeastern portion of Building 1 and the northwestern portion of Building 3.
- Sub-area 3H: Building 4 and the open access areas to the north, east, and south sides of the building.

- Area 4 Power Plant: (includes Buildings 5 and 6).

- Area 5 Industrial Water Treatment Plant: (includes Building 14).

- Area 6 GKN Facility: (includes Buildings 21, 22, 25, 27, 28, 29, 29A, and 39).

  - Sub-area 6A: Buildings 21, 29, and 29A, and all parking lots and open space to the south and west of these buildings.
  - Sub-area 6B: The area between Buildings 29 and 27, containing Buildings 22, 28, 39.
  - Sub-area 6C: Buildings 25 and 27 and parking lots and open space to the south of these buildings and within about 450 feet to the east.
  - Sub-area 6D Parking lots and open areas beginning about 450 feet east of Buildings 25 and 27 and extending to the north, south, and east property lines.

- Area 7 Engineering Campus: (includes Buildings 27A, 32, 33, and 34).

- Area 8 Office Complex North: (includes Buildings 220 and 221).

  - Sub-area 8A: Southern portion of Building 220, associated parking areas to the south and access areas to the east.
  - Sub-area 8B: Northern portion of Building 220 and the open area to the northwest of the building to the property boundary including smaller associated buildings, parking areas, and unpaved areas along the property boundary.
  - Sub-area 8C: Building 221 and the associated parking and access areas to the north, east, and west of the building.

- Area 9 Gun Range: (includes Buildings 10, 11, 11A, 12, and 13).

These Areas/Sub-areas are characterized by similarities in factors that affect public health risk under current and reasonable future land use conditions. Constituent data for soil and groundwater was compiled for each Area/Sub-area. The receptors, pathways, and complete routes of exposure for current and future land use were identified for each Area/Sub-area. Following are the critical receptors, pathways and complete routes of exposure for each Area/Sub-area:

Area	Current or Future	Receptor	Pathways/Complete Routes of Exposure
Area 1	Current	None	None
	Future	Construction worker	Ingestion of soil, Dermal contact with soil, Outdoor inhalation of vapors and particulates from soil, Dermal contact with groundwater, and Outdoor inhalation of vapors from groundwater.
Sub-area 2A to 2C, Sub-area 3A to 3H, Area 4, Area 5, Sub-area 6A to 6D, Sub-area 8A to 8C, and Area 9	Current	Non-residential worker	Indoor inhalation of vapors from subsurface soil, and Indoor inhalation of vapors from groundwater.
	Future	Construction worker	Ingestion of soil, Dermal contact with soil, Outdoor inhalation of vapors and particulates from soil, Dermal contact with groundwater, and Outdoor inhalation of vapors from groundwater.
Area 7	Current	Non-residential worker	None
	Future	Construction worker	None

Additional receptors include occasional visitors and maintenance workers whose exposure frequency and exposure duration are expected to be less than that for the non-residential worker and construction worker; hence the risk to these receptors will not be quantified.

The large number of constituents analyzed in soil and groundwater were screened to identify the constituents of concern (COC) for which quantitative risk was evaluated. Constituents that were non-detect in all soil samples were eliminated. Similarly, constituents that were non-detect in all groundwater samples were eliminated. The remaining constituents were further screened as discussed below.

Groundwater screening level was identified as one of the following (in the order shown):

(i) Maximum Contaminant Levels (MCL), or
(ii) EPA Health Advisory Concentration Levels (HA), or
(iii) Secondary Drinking Water Standards (SDWS), or
(iv) Risk-based target levels developed assuming water is used for residential purposes.

Constituents in groundwater for which the maximum detected concentration did not exceed the screening criteria in a specific Area/Sub-area were eliminated.

Constituents in soil were further screened using the following criteria:

- Background concentrations for metals. Metal constituents for which the maximum concentration in soil was less than these background concentrations in a specific Area/Sub-area, were not considered further.

The sample locations for which all the constituents in a specific chemical group (VOCs, TPH, Metals, PAHs, or PCBs) were non-detect, were not included in the calculation of average concentrations for constituents in that particular chemical group.

From the above screening, the list of COCs for each Area/Sub-area based on all media and all receptors is presented on Table ES-1. Arithmetic average concentrations for each COC for each receptor and each media were estimated.

Using the arithmetic averages as the representative concentrations for each COC, average site-specific data, and the models recommended in the Missouri Department of Natural Resources (MDNR) draft risk-based corrective action (RBCA) process document; risk for each Area/Sub-area was calculated. This would be the equivalent of a Tier 2 evaluation. The cumulative risk for each receptor in each Area/Sub-area is summarized on Table ES-2.

Based on the above evaluation, the cumulative risk for the following areas exceeded the regulatory acceptable level of 1×10^{-4} for carcinogens and hazard index (HI) of 1 for non-carcinogens:

- Sub-area 2A,
- Sub-area 2B,
- Sub-area 3A
- Sub-area 3C,
- Sub-area 3E,
- Sub-area 3G
- Sub-area 6B,
- Sub-area 6C, and
- Sub-area 8B.

For Areas/Sub-areas where the cumulative risk or risk for each COC and all exposure pathways exceeded the target risk, the primary constituents and routes of exposure that caused the exceedence are identified below:

Area	COC	Exceedence Due to
Sub-area 2A	TPH-GRO	Indoor inhalation from groundwater by non-residential worker
	TPH-DRO	Indoor inhalation from groundwater by non-residential worker
Sub-area 2B	Aliphatics >nC12 to nC16	Indoor inhalation from groundwater by non-residential worker
	Aliphatics >nC16 to nC21	Indoor inhalation from groundwater by non-residential worker
	Aliphatics >nC21 to nC35	Indoor inhalation from groundwater by non-residential worker
	Tetrachloroethene	Dermal contact with groundwater by future construction worker
Sub-area 3A	TPH-DRO	Indoor inhalation from groundwater by non-residential worker

Area	COC	Exceedence Due to
Sub-area 3C	TPH-DRO	Indoor inhalation from groundwater by non-residential worker
	TPH-ORO	Indoor inhalation from groundwater by non-residential worker
	Total TPH	Outdoor inhalation of vapors from groundwater by construction worker
Sub-area 3E	Aliphatics >nC16 to nC21	Indoor inhalation from groundwater by non-residential worker
Sub-area 3G	Aliphatics >nC21 to nC35	Indoor inhalation from groundwater by non-residential worker
Sub-area 6B	Aliphatics >nC16 to nC21	Indoor inhalation from groundwater by non-residential worker
	Benzo(a)anthracene	Dermal contact with groundwater by construction worker
Sub-area 6C	Aliphatics >nC16 to nC21	Indoor inhalation from groundwater by non-residential worker
	Aliphatics >nC21 to nC35	Indoor inhalation from groundwater by non-residential worker
Sub-area 8B	Aliphatics >nC16 to nC21	Indoor inhalation from groundwater by non-residential worker
	Aliphatics >nC21 to nC35	Indoor inhalation from groundwater by non-residential worker

The risk evaluation was based on a non-residential current and future land use and non-domestic use of groundwater.

The risk evaluation also identified the absence of ecological risks at the site and that the groundwater was not a source of domestic water.

Sub-areas that exceed acceptable levels will be considered in the corrective measure study (CMS).

Table ES-1
Chemicals of Concern (COCs)
Boeing Tract 1, St. Louis, Missouri

COCs	Area 1*	Sub-area 2A	Sub-area 2B	Sub-area 2C	Sub-area 3A	Sub-area 3B	Sub-area 3C	Sub-area 3D	Sub-area 3E	Sub-area 3F	Sub-area 3G	Sub-area 3H	Area 4	Area 5	Sub-area 6A	Sub-area 6B	Sub-area 6C	Sub-area 6D	Area 7**	Sub-area 8A	Sub-area 8B	Sub-area 8C	Area 9
1,1-Dichloroethane																X							
1,1-Dichloroethene			X					X								X							
1,1,2-Trichloro-1,2,2-trifluoroethane																X							
1,2,3-Trimethylbenzene	X		X													X							
1,2,4-Trimethylbenzene	X		X		X			X	X		X					X							
1,3,5-Trimethylbenzene					X			X			X												
2-Hexanone (MBK)																	X						
Acetone	X		X			X	X		X		X	X	X		X	X	X			X		X	X
Benzene	X	X	X	X	X	X	X	X	X		X				X	X							
Bromomethane																X							
Carbazole													X										
Carbon disulfide						X																	
Chloroethane			X					X															
Chloroform																	X						
cis-1,2-Dichloroethene			X		X											X	X			X			
Dichlorodifluoromethane		X														X	X	X					
Ethylbenzene	X	X	X	X	X	X		X	X		X					X	X						
Isopropylbenzene			X		X	X	X	X	X														
m,p-Xylene			X		X			X	X		X												
Methylene chloride		X	X	X	X		X		X			X	X			X				X			X
Methyl ethyl ketone			X									X	X		X	X	X	X		X	X		
Methyl isobutyl ketone																	X						
Methyl tert-butyl ether			X				X		X		X					X							
Naphthalene			X						X		X												X
n-Butylbenzene			X				X	X	X														
n-Propylbenzene	X		X		X	X	X	X	X														
o-Xylene			X					X			X						X						
p-Isopropyltoluene			X		X			X			X												
sec-Butylbenzene			X		X	X	X	X	X														
tert-Butylbenzene							X	X															
Tetrachloroethene		X	X					X								X		X				X	
Toluene	X	X	X	X	X	X	X		X		X		X			X		X		X			X
trans-1,2-Dichlorobenzene																X							
trans-1,2-Dichloroethene			X													X							
Trichloroethene		X	X					X								X	X			X			
Vinyl chloride			X		X			X								X	X			X			
Xylenes, Total	X	X	X	X	X	X	X	X	X		X	X	X			X	X						
Aroclor 1254																X							
Acenaphthene																X							
Acenaphthylene																X							
Anthracene													X										
Benzo(a)anthracene													X			X	X						
Benzo(a)pyrene								X					X										
Benzo(b)fluoranthene													X			X	X				X		
Benzo(g,h,i)perylene													X										
Benzo(k)fluoranthene													X										
Chrysene													X		X	X	X				X		
Dibenzo(a,g)anthracene													X										
Fluoranthene													X			X	X						
Fluorene																X							
Indeno(1,2,3-cd)pyrene													X										
Phenanthrene													X			X							
Pyrene													X			X							
Total Organics	**8**	**8**	**25**	**5**	**14**	**9**	**11**	**19**	**14**	**0**	**12**	**4**	**18**	**0**	**4**	**31**	**16**	**4**	**0**	**7**	**3**	**2**	**4**

Table ES-1
Chemicals of Concern (COCs)
Boeing Tract 1, St. Louis, Missouri

COCs	Area 1*	Sub-area 2A	Sub-area 2B	Sub-area 2C	Sub-area 3A	Sub-area 3B	Sub-area 3C	Sub-area 3D	Sub-area 3E	Sub-area 3F	Sub-area 3G	Sub-area 3H	Area 4	Area 5	Sub-area 6A	Sub-area 6B	Sub-area 6C	Sub-area 6D	Area 7**	Sub-area 8A	Sub-area 8B	Sub-area 8C	Area 9
Aliphatics > nC6 to nC8 (TX1006)			X			X			X		X					X	X				X		
Aliphatics > nC8 to nC10 (TX1006)			X			X			X		X					X	X				X		
Aromatics > nC8 to nC10 (TX1006)			X			X			X		X					X	X				X		
TPH-GRO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X
Aliphatics > nC10 to nC12 (TX1006)			X			X			X		X					X	X				X		
Aliphatics > nC12 to nC16 (TX1006)			X			X			X		X					X	X				X		
Aliphatics > nC16 to nC21 (TX1006)			X			X			X		X					X	X				X		
Aromatics > nC10 to nC12 (TX1006)			X			X			X		X					X	X				X		
Aromatics > nC12 to nC16 (TX1006)			X			X			X		X					X	X				X		
Aromatics > nC16 to nC21 (TX1006)			X			X			X		X					X	X				X		
TPH-DRO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X
Aliphatics > nC21 to nC35 (TX1006)			X			X			X		X					X	X				X		
Aromatics > nC21 to nC35 (TX1006)			X			X			X		X					X	X				X		
TPH-ORO	X	X	X	X	X	X	X	X	X	X	X	X	X					X					X
Total TPH	**3**	**3**	**14**	**3**	**3**	**14**	**3**	**3**	**14**	**3**	**14**	**3**	**3**	**2**	**2**	**13**	**13**	**3**	**0**	**0**	**11**	**2**	**3**
Aluminum																							
Antimony	X	X	X													X							
Arsenic	X	X	X		X			X				X	X	X	X	X	X	X		X	X		X
Barium								X							X	X	X			X			X
Beryllium	X	X	X					X								X							X
Cadmium		X	X					X							X	X	X						X
Chromium			X					X						X	X	X	X	X		X	X		X
Chromium, hexavalent																	X						
Cobalt	X	X	X													X							
Copper	X	X	X					X								X							X
Cyanide, total														X									
Manganese	X		X					X				X	X			X				X			X
Mercury	X	X	X		X									X		X	X			X	X		X
Nickel	X	X	X					X						X		X							X
Selenium	X		X					X					X	X	X	X	X						X
Silver			X																				X
Thallium			X					X															
Vanadium																							
Zinc		X	X					X								X							X
Total Metals	**9**	**9**	**14**	**0**	**2**	**0**	**0**	**11**	**0**	**0**	**0**	**2**	**3**	**6**	**5**	**13**	**7**	**2**	**0**	**5**	**3**	**0**	**12**
TOTAL COCs	**20**	**20**	**53**	**8**	**19**	**23**	**14**	**33**	**28**	**3**	**26**	**9**	**24**	**8**	**11**	**57**	**36**	**9**	**0**	**12**	**17**	**4**	**19**

Notes:

X: COC

* Area 1 risk estimate was not revised since risk using maximum concentration is acceptable as per draft risk assessment completed in July 2004.

** No risk calculation was completed for Area 7 since there is only one sample location and no industrial activities (see text for further details).

Table ES-2
Summary of Risk Results
Boeing Tract 1, St. Louis, Missouri

Area	Non-residential Worker		Construction Worker	
	IELCR	HI	IELCR	HI
Area 1 (Max.)	N/A	N/A	6.34E-07	0.50
Sub-area 2A	5.97E-08	**22**	3.52E-07	0.31
Sub-area 2B	7.57E-06	**96**	1.89E-05	**3.1**
Sub-area 2C	2.02E-08	0.95	3.92E-08	0.047
Sub-area 3A	7.90E-08	**2.6**	4.52E-08	0.055
Sub-area 3B	3.35E-09	0.31	4.66E-10	0.0071
Sub-area 3C	2.00E-08	**77**	2.34E-08	**1.3**
Sub-area 3D	2.93E-08	0.075	1.17E-07	0.048
Sub-area 3E	4.31E-08	**10**	8.02E-10	0.12
Sub-area 3F	NA	0.86	NA	0.0082
Sub-area 3G	6.02E-08	**2.8**	9.38E-08	0.12
Sub-area 3H	NA	0.70	6.35E-13	0.0058
Area 4	2.17E-10	0.47	2.60E-06	0.014
Area 5	NA	0.00053	6.37E-08	0.013
Sub-area 6A	1.12E-10	0.054	5.33E-08	0.0089
Sub-area 6B	1.44E-06	**7.9**	2.44E-05	0.17
Sub-area 6C	7.03E-08	**4.1**	8.36E-08	0.060
Sub-area 6D	2.99E-10	0.00014	8.25E-08	0.013
Area 7	N/A	N/A	N/A	N/A
Sub-area 8A	2.37E-08	0.00031	1.02E-07	0.020
Sub-area 8B	NA	**55**	3.74E-10	0.49
Sub-area 8C	NA	0.064	1.25E-12	0.0052
Area 9	1.79E-11	0.19	1.29E-11	0.008

Notes:

Number in bold exceeds the cumulative acceptable target levels.

IELCR: Individual excess lifetime cancer risk

HI: Hazard index

NA: Not available

N/A: Not applicable

Section
1.0

1.1 INTRODUCTION

This section presents an overview of the site, the available data, and our overall approach to evaluate risk for the Tract 1 Boeing site (Facility), located in Hazelwood, St. Louis County, Missouri. The overall risk approach presented here is consistent with the draft policies made by the Missouri Groundwater Rule Stakeholders Group. These draft policies have been documented in the process document (***Missouri Department of Natural Resources (MDNR) Preliminary Draft Process Document, June 2003***). It is anticipated that the results of this evaluation will be used to make risk based decisions to manage the impacts at this site.

1.2 ORGANIZATION OF REPORT

The Report consists of an Executive Summary followed by 12 sections and 10 appendices (see Table of Contents) bound in two separate volumes. The report text is provided in Volume 1 and the appendices are provided in Volume 2. Following the text in each Section 1.0 through 10.0 are the tables, figures, and attachments related to that individual section. The Report has two final sections to present the conclusions and recommendations, and references.

1.3 SITE DESCRIPTION

The Facility is located in Hazelwood, St. Louis County, Missouri, within Section 5, Township 46E, Range 6E. It is bounded to the south by St. Louis Lambert International Airport, to the west and northwest by Lindbergh Boulevard on the east by the Formerly Utilized Facility Remedial Action Program (FUSRAP) St. Louis Airport Site (SLAPS), and to the north by James S. McDonnell Boulevard (with the exception of a small portion of land to the north of McDonnell Boulevard, (see Figure 1-1 for details). In general, the Facility is located in a highly urbanized (industrial/commercial) setting. Tract 1 is divided into two sections: Tract 1-South (approximately 108 acres) is located south of Banshee Road; and Tract 1-North (approximately 120 acres) is located north of Banshee Road. There are approximately 80 buildings located within Tract 1 (North and South).

In 2001, Boeing sold a portion of the North Tract containing Buildings 27, 29 and 29A to GKN Aerospace (GKN). Boeing is in the process of vacating the South Tract and turning the buildings and land over to the owner, Lambert St. Louis International Airport, except for the Power Plant (Risk Area 4) and the Industrial Wastewater Treatment Plant (Risk Area 5). This process is scheduled to be completed by mid-2005. Boeing is retaining the Engineering Office Complex consisting of Buildings 32, 33, and 34 along with office and warehouse facilities in Buildings 27A, 220, and 221, and the Power Plant and Industrial Water Treatment Plant.

Aerospace manufacturing has been in continuous operation at the Facility since 1941. The Facility activities primarily consisted of the manufacturing of fighter aircraft and components. Processes include the fabrication of aluminum, titanium, composite structures, and other air frame material. The manufacturing processes also include metal cutting, metal forming and grinding, degreasing, painting, aircraft assembly, aircraft fueling, and aircraft flight testing.

Access to the Facility is strictly controlled. The Facility is surrounded by a chain-link fence and is patrolled by a security force 24 hours a day, 365 days per year. Employees and visitors must pass through security gates at the main entrance to the Facility before entering any building.

The Facility was permitted to store hazardous waste under RCRA permit number OSO 62284002. The Facility was also permitted to transport hazardous wastes from other Boeing (St. Louis) facilities for management and solvent recycling.

Boeing generated approximately 48 different waste streams that the Facility considered to be hazardous waste. The largest quantities of wastes generated consist of emulsified cutting oils, waste jet fuels, paint solids, solvent and paint wastes, wastewater treatment sludges, and acid and caustic wastes. Boeing stores hazardous waste at various locations around the Facility. Waste solvents, paints, and oils are accumulated in drums at numerous satellite accumulation locations. Boeing stored on-site-generated waste in drums at three less-than-90-day storage areas. Non-petroleum liquid wastes are either transported off-site for disposal, or neutralized and processed through the industrial wastewater treatment plant (IWTP). Liquids pretreated in the IWTP are discharged to the Metropolitan St. Louis Sewer District (MSD) publicly-owned treatment works under an industrial discharge permit. Petroleum wastes are stored in tanks or drums, and either blended and used as fuel for boilers (off-spec jet fuel only) or transported to a disposal facility. Sludge from the IWTP is transported to an off-site disposal facility.

In the past, Boeing operated three solvent distillation units which were certified as resource recovery units by the MDNR. Two of the distillation units were used to recover spent methyl ethyl ketone (MEK) and methyl isobutyl ketone (MIBK). One of these was located at the painting area in Building 27 and the other was located at the main paint booth in Building 48. Distillation bottoms were collected in 55-gallon drums and disposed as hazardous waste. The other distillation unit was a steam stripping carbon adsorption bed unit that recovered spent perchloroethylene (PCE) and was located in Building 51.

A total of approximately 68 underground storage tanks (USTs) have been located at the Facility since operations began in 1941. These USTs primarily have been used to store petroleum products (jet fuels JP-4 and JP-5, gasoline, diesel, and hydraulic oil) along with waste petroleum products (jet fuels, used oil). At various times, some USTs at the Facility were used to store solvents, lacquer thinner, hazardous waste sludge, alcohol, and water. A total of 11 USTs are currently in use at the Facility: 3 on the North Tract and 8 on the South Tract. A summary listing of all known USTs at the Facility is presented in Table 1-1.

Approximately 90-95% of the surface area of the Facility is covered with buildings, paved streets, paved parking lots, tankfarms, and docks.

1.4 INVESTIGATION HISTORY

Numerous investigations have been completed at the Boeing Tract 1 Facility, including document and operation reviews, visual inspections, and sampling efforts. These investigations have been conducted as part of the RCRA program [RCRA Facility Assessment (RFA) and RCRA Facility Investigation (RFI)], USTs removals and/or investigations, and environmental assessments with subsequent environmental investigations.

As summarized in the draft RFI (MACTEC, 2004), numerous assessment investigation activities have occurred at the Facility. These have resulted in a large body of soil and groundwater data.

In summary:

- 32 Solid Waste Management Units (SWMUs) were identified at the facility by the RFA (SAIC, 1995) (Table 1-2).
- 68 USTs have been present at the Facility (Table 1-2).
- 23 shallow monitoring wells (20 feet deep or less) were installed as part of the RFI; an additional 55 shallow monitoring wells were installed at the Facility during previous investigations. Eighteen of these monitoring wells have been closed.
- Nine monitoring wells were installed as part of the RFI to monitor the deep groundwater zone.
- Approximately 207 shallow soil borings and 10 soil borings to the top of bedrock were installed as part of the RFI investigation between February 1998 and July 2003.
- Temporary piezometers were installed in 172 of the shallow RFI borings and eight of the deep RFI borings to allow for the collection of groundwater samples.
- Nine shallow RFI borings and two deep RFI borings were completed as permanent piezometers to allow for collection of groundwater samples over time.
- 14 temporary piezometers and 2 monitoring wells sampled groundwater for TPH speciation/fractionation in April/May 2004.

Samples have typically been analyzed for a range of constituents; volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) including polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides, metals, total petroleum hydrocarbon (TPH) and cyanide, by a variety of analytical methods.

Laboratory data collected for RFI (1998 to 2003) and supplemental TPH in 2004 is available in a master database, however data collected for other investigations were only available in a hard copy. This risk evaluation considered all relevant historic soil and groundwater data. Generally, all soil data was used for quantitative evaluation. For groundwater, a minimum of the most recent two years of data up to a maximum of the most recent six years of data depending on the availability of data in each area was used. The objective was to use the data most representative of current conditions.

1.5 SITE GEOLOGY

A detailed description of the site's geology and hydrogeology is presented in the RFI (MACTEC, 2004). The following summary is based on the RFI. The geology at the site is divided into unconsolidated material (overburden) and bedrock.

Unconsolidated Material

The unconsolidated material which overlies the bedrock consists predominantly of silt, clay, silty clay, and clayey silt. The total thickness of this material is approximately 70 to 90 feet. There is a general increase in clay content with depth, with low permeability clay separating the upper zone [approximately zero to 15 feet below ground surface (bgs)] from the underlying bedrock. The upper zone consists predominantly of clayey silt (e.g., loess) with fill material (reworked silt/clay, bricks, gravel, etc.) in some areas. The fill is up to 10 feet thick. A distinct organic silt layer was noted across the site at approximately 10 to 15 feet bgs. Predominantly dense clay is present below the organic silt and extends down to bedrock. A thin (approximately one to three feet) basal (top of bedrock) sandy or gravelly interval was encountered in some borings, but (in general) has low permeability due to clay content and is not continuous across the site.

Bedrock

The bedrock underlying the unconsolidated material consists of either Mississippian Age limestone (eastern side of site) or Pennsylvanian Age cyclotherms (western side of site). The limestone is composed of the Ste. Genevieve and St. Louis formations. The limestones are generally clean, without abundant shale or chert. The Pennsylvanian Age cyclotherms consist of interbedded coal, shale, clay/silt, and limestone. The overall permeability of the Pennsylvanian beds is low, and these formations are considered an aquitard or barrier to groundwater flow.

1.6 HYDROGEOLOGY

The groundwater at the site has been divided into shallow and deep zones which are separated by low permeability clay. The shallow groundwater is typically encountered 4 to 14 feet bgs and is considered unconfined. The shallow groundwater elevations consistently show a flow direction towards Coldwater Creek, the receiving stream.

The hydraulic gradients, estimated from the 2002/2003 water levels, ranged from 0.007 to 0.015 feet/foot (ft/ft), with a Facility wide average of 0.01 ft/ft.

Numerous laboratory and field tests to determine the hydraulic conductivity of the unconsolidated materials have been conducted at the Facility as part of the RFI and during earlier investigations at the Facility. Similar tests have also been conducted at the nearby SLAPS. These tests included:

- Laboratory tests (Triaxial),
- Field slug tests, and
- Field pump tests.

An average hydraulic conductivity (K) value for the upper zone was determined to be 3.83×10^{-5} centimeters per second (cm/sec), with the shallow groundwater flow velocity estimated at 4.2 feet per year (MACTEC, 2004).

The deep groundwater zone includes an organic silt and low permeability clay (aquitard), which separates the deep and shallow groundwater zones and the underlying silty clay and basal sands and gravel. The deep groundwater zone is hydraulically separate from the upper groundwater zone (MACTEC, 2004). The groundwater potentiometric elevations for the deep zone vary considerably across the Facility and indicate that the deep groundwater zone is not a continuous or well defined hydrologic unit. Although the deep groundwater is within a confined groundwater zone and not directly hydraulically connected to Coldwater Creek, the deep groundwater is expected to flow to the northeast down the Coldwater Creek valley. The overall trend, however, is decreasing elevations towards the north, which follows the Coldwater Creek flow direction.

1.7 TOPOGRAPHY

The topography at the Facility is mostly level to gentle rolling hills, with local surface elevations ranging from 545 to 555 ft above mean sea level. The topography generally slopes across the Facility from west to east.

1.8 RELEVANT CLIMATE CONDITIONS

The annual average rainfall for the City of St. Louis is 37.5 inches per year. The prevailing winds at the site tend to be from the south in the Summer and Fall at an average speed of 8.7 miles per hour, and from the west and northwest in the Winter and Spring at an average speed of 11 miles per hour.

1.9 EXPOSURE ASSESSMENT

The quantification of risk at a site requires the following information:

1. Identification of constituents of concern (COCs),
2. Physical-chemical properties of COCs,
3. Toxicological properties of COCs,
4. Receptor Specific Exposure factors,
5. Fate and transport and uptake models to estimate the exposure point concentrations and dose, and
6. Fate and transport parameters.

In addition, for a Facility as large as this with varying conditions (primarily COCs and land use) across the Facility, the Facility has to be discretized into smaller areas that are more "homogeneous" from an exposure and risk perspective. This discretization of the Facility is presented in Section 1.9.1.

Each of the above inputs is discussed subsequently.

1.9.1 Discretization of Site

The Boeing facility, (Tract 1 North and Tract 1 South) has a total area of 228 acres. The area consists of a number of different land uses (manufacturing buildings, office buildings, parking lots, area for future runway, power plant, etc.). For risk assessment purposes the site was divided into the following nine Areas based on the current and future land use and activity patterns. The intent of these Areas is to define portions of the site that are relatively homogeneous in terms of risk and exposure factors, and to develop target levels for each Area consistent with the land use and/or other characteristics to the exposure condition of that Area. These Areas are presented below and locations are indicated on Figure 1-1:

- Area 1 Runway Protection Zone: (includes former Buildings 40, 45L, 45C, 45D, 45E, and parts of 45 and 45K).
- Area 2 Demolished Area: (includes former Buildings 45J, 51, 52, 48, 48A, and part of 45K).
- Area 3 Retained Area: (includes Buildings 42, 43, 45H, 41, 44, 44A, 46, 49, 1, 2, 3, and 4).
- Area 4 Power Plant: (includes Buildings 5 and 6).
- Area 5 Industrial Water Treatment Plant: (includes Building 14).
- Area 6 GKN Facility: (includes Buildings 21, 22, 25, 27, 28, 29, 29A, and 39).
- Area 7 Engineering Campus: (includes Buildings 27A, 32, 33, and 34).
- Area 8 Office Complex North: (includes Buildings 220 and 221).
- Area 9 Gun Range: (includes Buildings 10, 11, 11A, 12, and 13).

If there were multiple sources or multiple regions of an Area impacted by the same group of constituents (i.e. VOCs, PAHs, PCBs), the Area was further subdivided into Sub-areas. These Sub-areas were sized to contain single Areas of Impact.

The reasons for dividing the Areas into Sub-areas included:

- Focus the risk assessment calculation to match each Area of Impact;
- Avoid the perception of "diluting" the representative concentration by averaging beyond the Area of Impact for each source;
- Reduce the size of the area over which representative concentrations are calculated to better reflect the exposure domain for receptors,
- Use the results of the risk assessment to focus the Corrective Measures Study (CMS) on smaller areas found to exceed acceptable risk; and
- Receive no further action determination for Areas of the Facility that do not pose an unacceptable risk.

Four of the nine Areas were subdivided into Sub-areas. Area 1 was not subdivided since the maximum detected concentrations of the chemicals of concern did not result in unacceptable risk. Areas 4, 5, 7, and 9 were not subdivided since there were not multiple Areas of Impact within these Areas. Area 2 was divided into Sub-areas 2A, 2B and 2C. Area 3 was divided into eight Sub-areas 3A through 3H. Area 6 was further divided into four Sub-areas 6A, 6B, 6C and 6D. Area 8 was divided into Sub-areas 8A, 8B, and 8C. The details for each Sub-area are discussed in Sections 2 to 10.

1.9.2 Screening to Identify Constituents of Concern

All the organic and inorganic constituents (except for certain parameters that were analyzed to provide information regarding biodegradation activity – i.e., ammonia as nitrogen, nitrate as nitrogen, chloride, fluoride, sulfate, etc.) were retained for evaluation if they had (i) a positive detected value, or (ii) where a numerical detection limit was known.

Historic data, identified as 'ND', i.e., without the specific detection limit, ~~was~~ were not used in the quantitative risk evaluation process. The number of samples analyzed for each constituent includes the "NDs" in the count.

1.9.2.1 Groundwater

The risk assessment used only the groundwater sample data collected by MACTEC for its RFI, which included data from 1998 to 2003, along with subsequent sampling in 2004 for TPH. For metals, only total metal analyses were considered. Dissolved metal results were not considered. This is the conservative approach since total metal results are typically at higher concentrations than dissolved metal results.

When all the historic groundwater data collected at the Boeing facility ~~was~~ were evaluated, a total of 189 chemicals had been analyzed in at least one sample. In order to screen this list into a more manageable list of COCs, the data ~~was~~ were first broken down into each of the nine Areas. Constituents were screened as follows:

- Constituents were removed from consideration where the maximum concentration detected in groundwater was below the Maximum Contaminant Level (MCL) or other target level criteria. For constituents that do not have MCLs, three other target level criteria were compared in the following order of priority: (i) EPA Health Advisory

Concentration Levels (HA), (ii) Secondary Drinking Water Standards (SDWS), and (iii) risk-based target levels were developed assuming water is used for residential purposes, i.e., it included the ingestion of water and indoor inhalation of vapors from residential water use.

- Constituents were removed from consideration if they were not detected in any of the groundwater samples analyzed for that constituent in a specific Area/Sub-area.

The comparison for these constituents is presented in each of the Sections 2 to 10. Table 1-3 lists the MCLs and other target levels criteria. Once this comparison was completed, the remaining COCs were carried forward in the risk assessment.

1.9.2.2 Soil

If a VOC, TPH, PAH, or PCB constituents was detected in a soil sample for an Area/Sub-area, that constituent was retained as a COC. Metal constituents for which the maximum detected concentration in an Area/Sub-area was less than background concentrations were not considered. Also, individual metals that were non-detect for all soil samples analyzed in an Area/Sub-area were not considered further. Specific comparisons are presented in each area (Sections 2 to 10).

Table 1-4 lists the background concentrations for metals that were compiled based on a review of the following:

- StL - MACTEC Engineering and Consulting, Inc., May 2004, Draft RCRA Facility Investigation Report for McDonnell Douglas, Hazelwood, Missouri, Table 6-1 (St. Louis County Geometric Mean)

- MO - Tidball, Ronald R., 1984, Geochemical Survey of Missouri, Geological Survey Professional Paper 954-H,I (Missouri Statewide Geometric Mean)

- US - Shacklette, Hansford T. and Boerngen, Josephine G., 1984, U.S. Geological Survey Professional Paper 1270 (Eastern United States Geometric Mean)

- SLAPS - Environmental Assessment Division, Argonne National Laboratory, November 1993, Baseline Risk Assessment for Exposure to Contaminants at the St. Louis Site, St. Louis, Missouri, Table 2.8

1.9.2.3 Laboratory Qualifiers

The soil and groundwater samples included some detectable and non-detectable concentrations of constituents that also contained one or more of the following laboratory qualifiers. Typically, all detectable concentrations were considered in the risk assessment, including laboratory qualified data.

- B The indicated analyte was found in the associated method blank as well as in the sample (the sample value may be above or below the reporting limit).
- D Diluted: The original sample was diluted due to high amounts of one or more target analytes. Analytes will be subject to elevated detection limits relative to the dilution factor.

- DL Diluted: The original sample was diluted due to high amounts of one or more target analytes. Analytes will be subject to elevated detection limits relative to the dilution factor.

- E Estimated value: Analytical result exceeded the method upper calibration curve and the actual value is known to be higher than the upper calibration range.

- F Diluted: The original sample was diluted due to high amounts of one or more target analytes. Analytes will be subject to elevated detection limits relative to the dilution factor.

- H Re-analyzed: The indicated analytical results were generated from a re-injection of the same sample extract or aliquot.

- J Estimated value: Analytical result is estimated due to one of the following factors: constituent was detected above the method detection limit but below the practical quantitation limit or reporting limit; constituent did not successfully meet the established quality control criteria for accuracy, precision, or spike recovery; surrogate recoveries were not within method limits or diluted out.

- L Sample pretreatment: The sample reaction impaired the ability to analyze the sample using normal analytical determination. Treatment outside of method protocol was required to determine the analytical result.

- O Diluted: The original sample was diluted due to matrix interference of one or more target analytes. Analytes will be subject to elevated detection limits relative to the dilution factor.

- Q Sample was held beyond the accepted method holding time.

- R Rejected result: Indicated analytical result was rejected/not used due to failure of sample analysis to meet minimum method analysis requirements.

- T Sample was received past the method hold time or too close to the method holding time expiration.

- V Sample concentration was too high to evaluate spike recoveries.

- X Re-run sample analysis: The sample was diluted and re-analyzed (possibly performed re-analysis outside of recommended method hold time).

1.9.3 Representative Concentration Methodology

Representative concentrations were calculated for each constituent analyzed in each Area or Sub-Area using the following conventions:

- Constituents were grouped into VOCs, PAHs, PCBs, and TPH. The Area of Impact for soil was defined by the soil samples that had detections of an analyte within that group (i.e. if a sample had a benzene detection, that sample was utilized to calculate the representative concentrations for all of the VOC constituents analyzed in that sample. If

VOC constituents were below method detection limits in the sample, one half of the method detection limit for that constituent was used. This process was separately completed for groundwater.

- Samples (soil or groundwater) were not included in the Area of Impact representative concentration calculation for VOCs if the only detection in the sample was acetone and/or methylene chloride. These constituents are common laboratory contaminants and inclusion of the samples with just these detections would have resulted in a reduction of the calculated representative concentration for other COCs.
- Multiple groundwater samples collected from a monitoring well or permanent piezometer were averaged together to give a representative concentration for that well prior to use in the calculation of the representative concentration for the Area/Sub-area.
- Duplicate groundwater samples were averaged with the entire set of samples from the well as unique samples.
- Multiple analysis for constituents by different laboratory methods were averaged together as unique samples (i.e., BTEX analysis by EPA Methods OA-1 and 8260B). See Appendix K for multiple analysis data.

1.9.4 Physical and Chemical Properties of COCs

To perform the risk calculations, COCs were assigned physical and chemical properties from the MDNR Cleanup Levels for Missouri (CALM) document. A number of constituents were identified at the Boeing facility that did not have physical and chemical properties available from the CALM document. For these chemicals alternative sources were used to obtain this information. The following sources were used:

- U.S. EPA Region IX, April 2002. Preliminary Remediation Goals,
- Texas Commission on Environmental Quality, March 2001. Texas Risk Reduction Program, and
- TPH Criteria Working Group, June 1999. TPHCWG Series Volume 5: Human Health Risk-Based Evaluation of Petroleum Contaminated Sites: Implementation of the Working Group Approach.

Table 1-5 presents the physical and chemical properties for all constituents identified for risk calculation at the Boeing Facility.

1.9.5 Toxicological Properties of COCs

As with the physical and chemical properties, the MDNR CALM document did not contain toxicological properties for all constituents identified at the Boeing Facility. The following sources were used to obtain this information:

- U.S. EPA Region IX, April 2002. Preliminary Remediation Goals,
- Texas Commission on Environmental Quality, March 2001. Texas Risk Reduction Program, and
- TPH Criteria Working Group, June 1999. TPHCWG Series Volume 5: Human Health Risk-Based Evaluation of Petroleum Contaminated Sites: Implementation of the Working Group Approach.

Table 1-6 presents the toxicological properties for all constituents identified for risk calculation at the Boeing Facility.

1.9.6 Exposure Factors

The risk to each receptor in an area is calculated based on exposure factors presented in the MDNR CALM document except skin surface area for dermal contact with soil and soil to skin adherence factor where values were based on the Department of Health and Social Services (DHSS) recommendation. Table 1-7 presents the exposure factors used for risk calculation. Note that in general these are the upper 95th percentile values and are hence conservative. Note it is likely that future workers may spend time in more than one Area/Sub-area, i.e., they could be exposed to chemicals in multiple areas. However, the risk assessment considers the maximum exposure to a worker within each specific area. This is a conservative assumption because if a worker is present in more than one area, the risk to that worker will be less than the risk to a worker who stays in the same area.

1.9.7 Fate and Transport Models

The following models were used to estimate the risk as per the process document.

<u>Outdoor Inhalation from Subsurface Soil</u>
Emission – Jury
Dispersion – Open Box

<u>Indoor Inhalation from Subsurface Soil</u>
Emission – Johnson and Ettinger
Dispersion – Closed Box

<u>Indoor Inhalation from Groundwater</u>
Emission – Johnson and Ettinger
Dispersion – Closed Box

Appendix A includes the specific equations used to estimate the calculated risk-based concentrations.

1.9.8 Fate and Transport Parameters

Table 1-8 presents the fate and transport parameters required for the indirect routes of exposure. These parameters can be divided into three categories:

1. Parameters for which default literature values are used across the site.
2. Parameters for which site-specific values are used across the site.
3. Parameters for which site-specific values are used that vary for each exposure area.

Following is a discussion of the site-specific parameters.

Prevailing Wind Direction/Dimension of Soil Source

The Draft RFI report (MACTEC, 2004) presents average prevailing wind speed is 8.7 miles per hour (mph) from the south during the Summer and Fall, and 11.0 mph from the west and northwest during the Winter and Spring. Therefore, we used an average wind speed of 9.85 mph, and selected the most conservative dimension (longest dimension for an Area/Sub-area consistent with the varying wind directions). The dimensions for soil source used by Area/Sub-area are presented in Table 1-9.

Depth to Subsurface Soil Sources

Depth to subsurface soil sources was determined on an Area/Sub-area specific basis. It was always conservatively determined to be the average of the minimum depths at which organic impact was observed in the soil samples collected within that area. This is the depth at which the volatile chemicals predominantly occur and varies for each area. However, since the depth to subsurface soil source is based on the average depth of several samples in an Area/Sub-area, the average depth to subsurface soil source used in the risk calculations was no deeper than the average depth to groundwater for that specific Area/Sub-area. The depths to subsurface soil source used by Area/Sub-area are presented in Table 1-9.

Enclosed Space Volume/Infiltration Area Ratio

This parameter represents the ratio of the volume of the building to the surface area through which vapors migrate into the building. For Areas/Sub-areas where vapors migrate through the floor of the building only; i.e., buildings without basements, this parameter is equal to the height of the building. Conservatively, default value by MDNR of 300 cm (= approximately 12 ft) was used.

For buildings with basements where a portion of the basement height is surrounded by contaminated soil or groundwater, the vapor infiltration area is estimated as the area of the portion of the walls through which vapors enter the basement. In these cases, the enclosed space volume is conservatively assumed as the volume of the basement, not the entire building.

Fractional Organic Carbon Content in Soil

A total of 3 soil samples were collected at non-impacted locations across the Facility. An average of the results was used to produce a site-wide fractional organic carbon content in soil of 0.0477 g/cc (Table 1-10). This is a reasonable value, given that the lacustrian genesis of the shallow soil (the area was previously a lake); and therefore, would be anticipated to have significant organic carbon content.

Soil Moisture Content

In all, 35 soil samples collected above the average water depth (by Area/Sub-area) at the Facility for the RFI have been analyzed for water content in the unsaturated zone (0 – 10 ft). The gravimetric water content values range from 9.8 to 27.4 % with an average of 20.8 %. The gravimetric water content was converted to volumetric water content, 31.6 % and used for the risk calculations (Table 1-11).

Capillary Fringe Thickness

Based on the general soil type at 10 – 20 ft bgs (silty clay) and the typical depth to groundwater across the Facility, the capillary fringe thickness was estimated to be 192 cm. This value was obtained from US EPA (June 19, 2003). For the areas where the depth to groundwater is less than 192 cm, 70% of the depth to groundwater was used for the risk calculations.

Total Soil Porosity

Based on the general soil type in the upper zone (silty clay), the total soil porosity was estimated to be 0.48 cm^3/cm^3. This value was obtained from US EPA (June 19, 2003).

Dry Bulk Density

Two soil samples collected in shallow soil zone at the Facility have been analyzed for dry bulk density. The average of these, 1.52 g/cm^3, was used for the calculation (Table 1-12).

Depth to Groundwater

Depth to groundwater was determined for each Area/Sub area and was always conservatively determined to be the average depth to groundwater based upon measurements from up to four quarterly monitoring events per well between December 2002 and June 2003 (Table 1-13). Note Areas 5 and 9 have piezometers but no monitoring wells. For these two areas, the depth to groundwater was determined based on evaluation of the boring logs, and was the average depth at which the boring logs indicated groundwater. If there was no indication, then the average depth at which the first occurrence wet or saturated soil samples (average depth to first description of saturated or wet soils in the boring logs for the Area) was used.

Thickness of Vadose Zone

The thickness of the vadose zone is equivalent to the total depth to groundwater minus the capillary fringe thickness. It is determined by the capillary fringe thickness and the depth to groundwater, hence this value varies by Area/Sub-area.

1.9.9 Acceptable Risk Level

The risk to human health was calculated using the forward mode, i.e. the risk from each chemical was calculated, and compared with a target risk, set by MDNR. As per the process document following are the target risks for each receptor:

1. An individual excess lifetime cancer risk (IELCR) of 1×10^{-5} for each carcinogenic constituent and all exposure pathways was used. A hazard index (HI) of 1 for each non-carcinogenic constituent and all exposure pathways was used.
2. For all constituents and all exposure pathways, the cumulative IELCR of 1×10^{-4} and the HI of 1 were used for comparison purposes.

1.9.10 Consideration of TPH in the Risk Assessment

Several soil and groundwater samples have been analyzed for TPH using a variety of different TPH methods. These have resulted in a variety of different TPH values, e.g., diesel # 1, kerosene, stoddard solvent, motor oil, etc.

Since the TPH values reported are a mixture of several constituents whose composition and toxicity change due to weathering (note toxicity generally decreasing), there is no unique way to evaluate the risk from TPH measurements. As such the following approach was used:

The various TPH values reported were classified as TPH-GRO (gasoline range organic), TPH-DRO (diesel range organic), or TPH-ORO (oil range organic). Table 1-14 shows the various

TPH values and their allocations to one of these three TPH fractions.

Each of the TPH-GRO, TPH-DRO, and TPH-ORO fractions was considered to consist of the following aromatic and aliphatic fractions:

TPH-GRO		TPH-DRO		TPH-ORO	
Aliphatics	Aromatics	Aliphatics	Aromatics	Aliphatics	Aromatics
>C6-C8 >C8-C10	>C8-C10	>C10-C12 >C12-C16 >C16-C21	>C10-C12 >C12-C16 >C16-C21	>C21-C35	>C21-C35

C: Carbon atom

In order to get site-specific estimate of the aliphatic and aromatic fractions, groundwater samples were collected in April/May 2004 for several Sub-areas and analyzed for TPH-GRO, TPH-DRO, and TPH-ORO using TX Method 1005 and SW 846 Method 8260, and the fractions using the Texas method 1006. These results were used in the risk assessment as follows:

- If there are TPH-GRO results by both TX 1005 and SW 8260, the results by SW 8260 were used for the calculations of average TPH-GRO concentration.
- If there are TPH-DRO and TPH-ORO results by TX 1005, the results were used for the calculations of average concentration.
- Using TX 1006, the ratio of each aliphatic and aromatic fraction to the total TPH concentration was estimated and is shown in Table 1-15. The TX 1006 results for aliphatic C6 and aromatic C7 – C8 were not used since these lower fractions were measured by individual volatile organic compounds.
- These ratios were applied to the average TPH results in each Sub-area to estimate the individual fraction concentrations. These fractions are shown highlighted in Table 1-15.

If there were no TX 1006 results (soil and some groundwater results), then the average concentrations for TPH-GRO, TPH-DRO, and TPH-ORO were divided equally for their specific fractions shown above. The risk for each of the carbon fractions was calculated (as if each were a single constituent). The risk for TPH fractions were calculated as the sum of the risk of the various carbon fractions.

1.9.11 Consideration of Lead

The primary toxicity of lead is to children in a residential scenario and fetuses carried by female workers in non-residential scenarios. For children, human exposures to lead are estimated using the integrated exposure uptake biokinetic (IEUBK) model to estimate the risk of elevated blood levels in children under the age of seven. For non-residential scenarios, US EPA (1996) uses the adult lead methodology (ALM) to assess the risk to fetuses. Both these models are under review by EPA.

Based on these models, EPA (1996) has developed a screening level for non-residential soils of 750 mg/kg and 400 mg/kg for residential areas. The value of 750 mg/kg has been used to determine whether lead is a constituent of concern in soil.

For groundwater, MCL of lead of 15 ug/L has been used to determine whether lead is a constituent of concern in groundwater. However, in some areas monitoring wells/piezometers were sampled for both total lead and dissolved lead concentrations in groundwater. In general, and as expected, total lead concentrations exceed dissolved lead concentrations due to the

suspended solids content in a sample. For example, a sample with little or no suspended solids content would typically have similar concentrations for total lead and dissolved lead. For samples with increasing suspended solids content, the total lead concentration is typically higher than the dissolved lead concentration since the analysis detects both the dissolved lead in the water as well as the lead content of the suspended solid particles. For samples with dissolved lead concentrations, the determination to screen lead out is based on comparing the dissolved lead concentration to the MCL.

Locations/samples where lead concentrations exceed these levels are discussed in the respective sections.

1.9.12 Consideration of 1,2-Dichloroethene

The laboratory data for 1,2-dichloroethene (total), cis-1,2-dichloroethene, and trans-1,2-dichloroethene have been reported in two different ways. For some samples, only 1,2-dichloroethene (total) has been reported. For others, values of cis-1,2-dichloroethene and trans-1,2-dichloroethene, were reported.

For the former case, the entire concentration was conservatively assigned to cis-1,2-dichloroethene which is the more toxic of the two isomers. If the calculated risk exceeded the acceptable level, 1,2-dichloroethene (total) concentration was assigned 50% as cis-1,2-dichloroethene and 50% as trans-1,2-dichloroethene. This is consistent with a tiered risk evaluation where constituents are screened first using very conservative assumptions and if they do not screen out, less conservative but still reasonable assumptions are made. However, all calculated risks using 100% cis-1,2-dichloroethene for 1,2-dichloroethene (total) were acceptable; therefore, there were no instances where the risk was recalculated using 50% cis-1,2-DCE and 50% trans-1,2-DCE for 1,2-DCE (total). By substituting cis-1,2-DCE for 1,2-DCE (total), a "worst-case" risk is calculated, since cis-1,2-DCE is the most toxic compared to trans-1,2-DCE.

For risk calculation in the second case, the individual concentrations of cis-1,2-dichloroethene and trans-1,2-dichloroethene were used.

1.10 WATER USE

Water supplies in the St. Louis area are obtained from the Mississippi, Missouri and Meramec Rivers. Aquifers exist in both the bedrock and unconsolidated deposits along the Mississippi and Missouri Rivers. At its closest point, the Missouri River is three miles to the northwest of the site. Bedrock aquifers are present throughout the St. Louis area to depths of up to 800 feet. The majority of the water occurs in fractures and solution pathways of the limestone which results in very erratic yields usually between 10-15 gpm. The bedrock aquifers are generally not utilized for drinking water purposes in the St. Louis area.

A total of eight private wells were identified within a 3-mile radius of the FUSRAP North County site consisting of SLAPS and the Hazelwood Interim Storage Site (HISS) (USACE, 2003). These wells range in depth from 35 feet to 400 feet and none of these are used for drinking water. Four of these wells had been used for irrigation and one for industrial purposes. The three other wells had been used for domestic use and were capped and abandoned in 1962, 1968, and 1979 (BNI, 1992). Most of these wells are installed into fractured bedrock where better yields can be obtained as compared to the shallow unconsolidated formation (USACE, 2003). Only one well was identified within one mile of the Facility (Golder and Associates, 2003). This well was reported to have been installed in 1968 to a depth of 44 feet as an observation well. The well is

located approximately 0.5 mile southwest of the Facility in the area of the current westward airport expansion.

Therefore, the groundwater underlying the Facility is not currently used as a drinking water supply and is not likely to be used for this purpose given the industrial/urban setting and the availability of the public water supply system.

The Facility is located in an area that is not considered favorable for the development of high-yield wells due to yields generally less than 50 gallons per minute (gpm) in shallow aquifers containing potable water, and deeper aquifers yield saline water. The Facility is in a bedrock area mapped as having high chloride content and high sulfate concentrations; therefore, the water quality of the uppermost bedrock aquifer is likely poor and not suitable as potable water (MACTEC, 2004).

Additionally, the area around SLAPS and HISS does not contain any ecologically vital groundwaters (MACTEC, 2004).

An evaluation of groundwater use as a potential drinking water source has concluded that groundwater (shallow and deep) is not currently being used at the Facility and is not considered a likely drinking water source in this area. Hence the drinking water pathway will not be further evaluated during this risk assessment.

1.11 SURFACE WATER BODIES

Coldwater Creek is located at the eastern edge of the Facility (Sub-area 6D) and below Area 9 between Area 4 and Area 5. Surface water and groundwater from the site flows toward the creek. The creek flows northeast within an underground culvert from the southwest side of the airport, across the central portion of the airport, and then flows into an open culvert beginning north of the railroad tracks on the north side of Banshee Road north of Area 9 and continues to the north for several miles until it rejoins its original channel. The creek eventually discharges into the Missouri River.

Coldwater Creek is designated as a metropolitan no-discharge stream except for permitted discharges and non-contaminated storm water flows. Coldwater Creek from its mouth at the Missouri River upstream 5.5 miles to its crossing with US Highway 67 (Lindbergh Boulevard) is classified by MDNR as a Class "C" waterway meaning that there are periods of no flow in the Creek, but permanent pools are always present. The upstream portion of the Creek between the Airport and Highway 67, which includes the Facility and SLAPS, is an unclassified water of the state.

The water quality in Coldwater Creek is generally poor. Studies of aquatic life (USACE, 2001) indicate that the stream ecology is severely impacted. The nature of pollution causing this impact is not definitively known but is believed to result from storm water from commercial and industrial facilities, residential areas, and the Airport. More than a dozen facilities that are permitted under the National Pollutant Discharge Elimination System (NPDES) program discharge directly into the stream, including Ford Motor Company, Lambert-St. Louis International Airport, and Boeing. These discharges include storm water runoff, cooling water discharge, water treatment, and airport and road deicing (MACTEC, 2004).

Table 1-1
Summary of Underground Storage Tanks at Boeing Tract 1, Hazelwood, Missouri

Number	Building/Location	DNR Tank Registration	Regulated	Volume (gals)	Contents	Construction Materials	Year Installed	Status	Leak Detection	Remedial Actions
B1	Bldg. 41	N/A	Yes	4,000	T-979 Solvent	Single Wall Steel	1947	Removed 1981/not Replaced	N/A	Excavated
B2	Bldg. 41	N/A	Yes	4,000	Lacquer Thinner	Single Wall Steel	1947	Removed 1981/not Replaced	N/A	Excavated
B3	Bldg. 41	N/A	Yes	8,000	Aviation Gas	Single Wall Steel	1947	Removed 1981/Replaced	N/A	Excavated
B4	Bldg. 41	N/A	Yes	8,000	Gasoline	Single Wall Steel	1947	Removed 1981/Replaced	N/A	Excavated
B5	Bldg. 41	N/A	Yes	4,000	JP-5	Single Wall Steel	1981	Removed 1989/Replaced by F41	N/A	Excavated
B6	Bldg. 41	N/A	No	15,000	JP-4	Single Wall Steel	1947	Removed 1957/Replaced	N/A	Excavated
B7	Bldg. 41	N/A	No	15,000	JP-4	Single Wall Steel	1947	Removed 1957/Replaced	N/A	Excavated
B8	Bldg. 41	N/A	Yes	15,000	JP-4	Single Wall Steel	1948	Removed 1989/Replaced by A41	N/A	Excavated
B9	Bldg. 41	N/A	Yes	15,000	JP-4	Single Wall Steel	1948	Removed 1989/Replaced by B41	N/A	Excavated
B10	Bldg. 41	N/A	Yes	15,000	JP-4	Single Wall Steel	1957	Removed 1989/Replaced by C41	N/A	Excavated
B11	Bldg. 41	N/A	Yes	15,000	JP-4	Single Wall Steel	1957	Removed 1989/Replaced by D41	N/A	Excavated
B12	Bldg. 41	N/A	Yes	8,000	Gasoline	Fiberglass Reinforced Plastic	1981	Removed 1989/Replaced by E41	N/A	Excavated
B13	Bldg. 41	N/A	Yes	8,000	JP-5	Fiberglass Reinforced Plastic	1981	Removed 1989/Replaced by F41	Inventory Stick	Excavated
B14	Flight Operations/A-41	8027	No/Exempt	30,000	Jet Fuel	Double Wall Fiberglass	1989	Current	Interstitial Alarm	None
B15	Flight Operations/B-41	8027	No/Exempt	30,000	Jet Fuel	Double Wall Fiberglass	1989	Current	Interstitial Alarm	None
B16	Flight Operations/C-41	8027	No/Exempt	30,000	Jet Fuel	Double Wall Fiberglass	1989	Current	Interstitial Alarm	None
B17	Flight Operations/D-41	8027	No/Exempt	30,000	Jet Fuel	Double Wall Fiberglass	1989	Current	Interstitial Alarm	None
B18	Company Vehicles/E-41	8027	Yes	8,000	Gasoline	Double Wall Fiberglass	1989	Current	Interstitial Alarm	None
B19	Flight Operations/F-41	8027	No/Exempt	8,000	Water	Double Wall Fiberglass	1989	Current/Not in use	Interstitial Alarm	None
B20	Bldg. 1	N/A	No	500	Gasoline	Single Wall Steel	1956	Removed 1961/Not Replaced	N/A	Excavated
B21	Bldg. 1	N/A	No	500	Gasoline	Single Wall Steel	1961	Removed 1972/Not Replaced	N/A	Excavated
B22	Bldg. 1	8021	Yes	6,000	Diesel	Single Wall Steel	1972	Removed 1980/Not Replaced	N/A	Excavated
B23	Bldg. 1	8021	Yes	5,000	Gasoline	Single Wall Steel Relined in 1979	1941	Removed 1989/Not Replaced	Inventory Control	Excavated
B24	Bldg. 2	N/A	Yes	1,000	Gasoline/Diesel	Single Wall Coated Tar Epoxy Steel	1942	Removed 1989/Not Replaced	N/A	Excavated
B25	Bldg. 45	N/A	Yes	335	Diesel	Single Wall Steel	1958	Removed 1987/Not Replaced	N/A	Excavated
B26	Bldg. 45C/45D (Site #4)	N/A	Yes	3,380	Waste JP-4	Single Wall Steel	1963	Removed 1983/Not Replaced	N/A	Excavated
B27	Bldg. 45C/45D (Site #4)	N/A	Yes	3,380	Waste JP-4	Fiberglass Reinforced Plastic	1983	Removed 1989/Not Replaced	Inventory Stick	Excavated
B28	Bldg. 45E	N/A	Yes	2,130	Waste JP-4	Fiberglass Reinforced Plastic	1978	Removed 1990/Not Replaced	Inventory Stick	Excavated
B29	Bldg. 45, Fuel Pit #3 (Site #2)	N/A	Yes	2,000	Waste JP-4	Single Wall Steel	1977	Removed 1992/Not Replaced	Inventory Stick	Excavated/ Recovery Wells with closure 2002
B30	Bldg. 45, Fuel Pit #4 (Site #2)	N/A	Yes	2,000	Waste JP-4	Single Wall Steel	1983	Removed 1992/Not Replaced	Inventory Stick	Excavated/ Recovery Wells with closure 2002
B31	Bldg. 45K (Site #1)	N/A	Yes	4,380	Waste JP-4	Fiberglass Reinforced Plastic	1983	Removed 1993/Not Replaced	Inventory Stick	Excavated/Recovery Wells with closure 1999
B32	Bldg. 51	N/A	Yes	6,000	Solvents	Single Wall Steel	1977	Removed 1986/Not Replaced	Inventory Stick	Excavated
B33	Bldg. 43 Fuel Farm	UT0005886	Yes	20,000	Jet Fuel	Single Wall Steel	1957	Removed 1991/Not Replaced	Inventory Stick	Excavated total site of 799 cu yds
B34	Bldg. 43 Fuel Farm	UT0005886	Yes	20,000	Jet Fuel	Single Wall Steel	1957	Removed 1991/Not Replaced	Inventory Stick	Excavated total site of 799 cu yds
B35	Bldg. 43 Fuel Farm	UT0005886	Yes	20,000	Jet Fuel	Single Wall Steel	1957	Removed 1991/Not Replaced	Inventory Stick	Excavated total site of 799 cu yds

Table 1-1
Summary of Underground Storage Tanks at Boeing Tract 1, Hazelwood, Missouri

Number	Building/Location	DNR Tank Registration	Regulated	Volume (gals)	Contents	Construction Materials	Year Installed	Status	Leak Detection	Remedial Actions
B36	Bldg. 43 Fuel Farm	UT0005886	Yes	20,000	Jet Fuel	Single Wall Steel	1957	Removed 1991/Not Replaced	Inventory Stick	Excavated total site of 799 cu yds
B37	Bldg. 43 Fuel Farm	UT0005886	Yes	20,000	Jet Fuel	Single Wall Steel	1957	Removed 1991/Not Replaced	Inventory Stick	Excavated total site of 799 cu yds
B38	Bldg. 6 (Boeing)	N/A	No/Exempt	20,000	Fuel Oil	Double Wall Steel/Plastic Coated	1989	Closed in Place	Inventory Control	No action
B39	**Bldg. 6 (Boeing)**	**N/A**	**No/Exempt**	**20,000**	**Fuel Oil**	**Double Wall Steel/Plastic Coated**	**1989**	**Current**	**Inventory Control**	**No action**
B40	**Bldg. 14 (Boeing)**	**N/A**	**No/Exempt**	**120,000**	**Haz Waste Sludge**	**Concrete with Rubber Liner**	**1941**	**Current**	**Visual Inspection**	**No action**
B41	Bldg. 5	N/A	No	15,000	Fuel Oil	Single Wall Steel	1941	Removed 1988	Visual Inspection	Excavated
B42	Bldg. 5	N/A	No	15,000	Fuel Oil	Single Wall Steel	1941	Removed 1988	Visual Inspection	Excavated
B43	Bldg. 5	N/A	No	6,000	Fuel Oil	Single Wall Steel	1941	Removed 1988	Visual Inspection	Excavated
B44	Bldg. 6	N/A	Yes	1,000	Waste Oil	Single Wall Steel	1970	Removed 1988	Visual Inspection	Excavated
B45	Bldg. 221	N/A	No	5,000	Fuel Oil	Single Wall Steel	1954	Removed 1990/Not Replaced	Visual Inspection	Excavated
B46	Bldg. 33	N/A	Yes	3,000	Diesel	Single Wall Steel	1960	Removed 1990/Not Replaced	Visual Inspection	Excavated
B47	Bldg. 33	N/A	No	20,000	Fuel Oil	Single Wall Steel	1960	Removed 1990/Not Replaced	Visual Inspection	Excavated
B48	Bldg. 32	N/A	Yes	500	Gasoline	Single Wall Steel	1975	Removed 1990/Not Replaced	Visual Inspection	Excavated
B49	Bldg. 32	N/A	No	10,000	Fuel Oil	Single Wall Steel	1955	Removed 1990/Not Replaced	Visual Inspection	Excavated
B50	Bldg. 34	N/A	Yes	850	Diesel	Single Wall Steel	1961	Removed 1990/Not Replaced	Visual Inspection	Excavated
B51	Bldg. 34	N/A	No	10,000	Fuel Oil	Single Wall Steel	1961	Removed 1990/Not Replaced	Visual Inspection	Excavated
B52	Bldg. 22	N/A	Yes	5,000	Leaded Gasoline	Single Wall Steel	1942	Removed 1961 & Replaced	Visual Inspection	Excavated
B53	Bldg. 22	N/A	Yes	7,520	Leaded Gasoline	Single Wall Steel	1961	Removed 1989 & Replaced	Inventory Control	Excavated
B54	**Bldg. 22**	**UT0008016**	**Yes**	**8,000**	**Unleaded Gasoline**	**Double Wall Fiberglass**	**1989**	**Retrofitted in 1995**	**Inventory Control**	**No action**
B55	Bldg. 22	UT0008016	Yes	10,000	Unleaded Gasoline	Single Wall Fiberglass	1981	Removed in 1995 & Replaced	Inventory Control	Excavated
B56	**Bldg. 22**	**UT0008016**	**Yes**	**10,000**	**Unleaded Gasoline**	**Double Wall Plastic Coated Steel**	**1995**	**Current**	**Interstitial Alarm**	**No action**
B57	Bldg. 22	UT0008016	Yes	10,000	Diesel	Single Wall Fiberglass	1981	Removed in 1995 & Replaced	Inventory Control	Excavated
B58	**Bldg. 22**	**UT0008016**	**Yes**	**10,000**	**Diesel**	**Double Wall Plastic Coated Steel**	**1995**	**Current**	**Interstitial Alarm**	**No action**
B59	Bldg. 25	UT0005954	Yes	8,000	Methyl Alcohol	Single Wall Steel	1984	Removed in 1995/Not Replaced	Inventory Control	Excavated
B60	Bldg. 28	UT0008017	Yes	5,000	Jet Fuel	Single Wall Steel	1955	Removed in 1989 & Replaced	Inventory Control	Excavated
B61	Bldg. 28	UT0008017	Yes	5,000	Jet Fuel	Single Wall Steel	1955	Removed in 1989 & Replaced	Inventory Control	Excavated
B62	Bldg. 28	UT0008017	Yes	5,000	Waste Jet Fuel	Single Wall Steel	1953	Removed in 1989 & Replaced	Inventory Control	Excavated
B63	Bldg. 28	UT0008017	Yes	5,000	Jet Fuel	Double Wall Steel	1989	Removed in 2000/Not Replaced	Inventory Control	Excavated
B64	Bldg. 28	UT0008017	Yes	5,000	Jet Fuel	Double Wall Steel	1989	Removed in 2000/Not Replaced	Inventory Control	Excavated
B65	Bldg. 28	UT0008017	Yes	5,000	Waste Jet Fuel	Double Wall Steel	1989	Removed in 2000/Not Replaced	Inventory Control	Excavated/RCRA Corrective Action
B66	Bldg. 29	UT0008019	Yes	4,000	Hydraulic Oil	Single Wall Fiberglass	1980	Removed in 1994/Not Replaced	Visual Inspection	Excavated
B67	Bldg. 20	N/A	No	250	Fuel Oil	Single Wall Steel	1943	Removed in 1999/Not Replaced	Visual Inspection	Excavated
B68	Bldg. 42	N/A	No	Unknown	Aviation Gasoline	Single Wall Fiberglass	Unknown	Removed Date Unknown/ Not Replaced	Visual Inspection	Excavated

Notes:
Bldg - Building
gals - gallons
cu yds - cubic yards
N/A - Not Applicable
Bold indicates the status of the tank is current

Table 1-2
Solid Waste Management Units (SWMU) at Boeing Tract 1, Hazelwood, Missouri

Unit	Description	Building
1	Waste Sodium Hydroxide Storage, AST Tanks H19 and H 20	52
2	Waste Nitric and Hydrofluoric Acid Solution Storage, AST Tanks H12, H13, and H14	52
3	Wastewater Sludge Collection and Holding Tank	14
4	Leaked or Spilled Jet Aircraft Fuel Storage Tank	28
5	Current Reactive Cyanide and Sulfide-Bearing Waste Storage, Area 2	22
6	Former Reactive Cyanide and Sulfide-Bearing Waste Storage, Area 2	22
7	Explosive Waste Storage, Area 3	10
8	Scrap Dock Shelter, Area 1	39
9	Waste Nitric and Hydrofluoric Acid Solution Storage, AST Tanks H1, H2, H3, H4, H5, and H6	52
10	Current Waste Oil AST	5
11	Former Waste Oil UST	6
12	Waste Jet Aircraft and Hydraulic System Spillage, F-18 Silencer	45E
13	Waste Jet Aircraft Fuel and Hydraulic System Spillage Storage Tank, Hush House	45C/45D
14	Waste Jet Aircraft Fuel Storage Tanks, Fuel Pits #3 and #4	45
15	Waste Jet Fuel Storage Tank, Ramp Station 1 and 2	45K
16	Methyl Ethyl Ketone (MEK)/Methyl Isobutyl Ketone (MIBK) Recovery Unit	48
17	Perchloroethylene (PCE) Recovery Unit	51
18	Methyl Ethyl Ketone/Methyl Isobutyl Ketone Recovery Unit	27
19	Drum Storage Areas and Related Satellite Accumulation Areas	Numerous
20	Paints Solids Satellite Accumulation Areas	Numerous
21	Industrial Wastewater Treatment Plant Tanks, S-1, S-2, S-3, S-4, E-1, E-2, and E-3	14
22	Paint Booth Satellite Accumulation Drum	2
23	Less-Than-90-Day Storage Area	45C/45D
24	Less-Than-90-Day Storage Area	2
25	Less-Than-90-Day Storage Area	51
26	Former Less-Than-90-Day Storage Area	40
27	Waste Nitric and Hydrofluoric Acid Scrubber Saddles Drums Storage	52
28	Leaking Transformer	6
29	Waste Ferracoat, Methyl Ethyl Ketone, and Trichloroethylene Drum Storage	29A
30	Chemical Etching Spill Containment Area	27
31	Maintenance Shop Waste Oil Tank	22
32	Polychlorinated Biphenyls (PCB) Storage Area	39

Notes:
AST: Above ground storage tank
UST: Underground storage tank

Table 1-3
Groundwater Screening Criteria
Boeing Tract 1, St. Louis, Missouri

COC	MCL (ug/L)	Health Advisory (ug/L)	Sec. Std. (ug/L)	GW Target Level (ug/L)
1,1,1,2-Tetrachlorethane		70		
1,1,1-Trichloroethane	200			
1,1,2,2-Tetrachloroethane		0.3		
1,1,2-Trichloro-1,2,2-trifluoroethane				12.3
1,1,2-Trichloroethane	5			
1,1-Dichloroethane				157
1,1-Dichloroethene	7			
1,1-Dichloropropene				4.41
1,2,3-Trichlorobenzene				8.55
1,2,3-Trichloropropane		40		
1,2,3-Trimethylbenzene				2.6
1,2,4-Trichlorobenzene	70			
1,2,4-Trimethylbenzene				2.59
1,2-Dibromo-3-chloropropane	0.2			
1,2-Dibromoethane		0.04		
1,2-Dichlorobenzene		600		
1,2-Dichloroethane	5			
1,2-Dichloropropane	5			
1,3,5-Trimethylbenzene		10,000		
1,3-Dichlorobenzene		600		
1,3-Dichloropropane		30		
1,4-Dichlorobenzene	75			
1,4-Dioxane		300		
2,2-Dichloropropane				1.75
2,2-oxybis (1-Chloropropane)				
2,4,5-TP (Silvex)	50			
2,4,5-Trichlorophenol				121
2,4,6-Trichlorophenol		10		
2,4-D	70			
2,4-Dichlorophenol		20		
2,4-Dimethylphenol				24.3
2,4-Dinitrophenol				2.43
2,4-Dinitrotoluene		5		
2,6-Dinitrotoluene		5		
2-Butanone (MEK)		4,000		
2-Chloroethyl vinyl ether				30.4
2-Chloronaphthalene				461
2-Chlorophenol		40		
2-Chlorotoluene		100		
2-Hexanone				1.74
2-Methylnaphthalene				115
2-Methylphenol (o-Cresol)				60.7
2-Nitroaniline				0.0347
2-Nitrophenol				1.53
2-Nitropropane				0.0151
3,3'-Dichlorobenzidine				1.49
3-Nitroaniline				0.748
4,4'-DDD				2.8
4,4'-DDE				1.98

Table 1-3
Groundwater Screening Criteria
Boeing Tract 1, St. Louis, Missouri

COC	MCL (ug/L)	Health Advisory (ug/L)	Sec. Std. (ug/L)	GW Target Level (ug/L)
4,4'-DDT				1.98
4,6-Dinitro-2-methylphenol				31.3
4-Bromophenyl phenyl ether				1.28E-05
4-Chloro-3-methylphenol				9.04
4-Chloroaniline				4.86
4-Chlorophenyl phenyl ether				1.28E-05
4-Chlorotoluene		100		
4-Isopropyltoluene				
4-Methyl-2-pentanone (MIBK)				32.7
4-Methylphenol (p-Cresol)				6.07
4-Nitroaniline				31.3
4-Nitrophenol		60		
Acenaphthene		2,000		
Acenaphthylene				346
Acetone				121
Acetonitrile				20.6
Acrolein				0.00877
Acrylonitrile		6		
Alachlor	2			
Aldrin		0.2		
Allyl chloride				0.445
Alpha-BHC				0.107
Alpha-chlordane				1.92
Aluminum			50-200	
Aniline				0.441
Anthracene		10,000		
Antimony	6			
Aroclor 1016	0.5			
Aroclor 1221	0.5			
Aroclor 1232	0.5			
Aroclor 1242	0.5			
Aroclor 1248	0.5			
Aroclor 1254	0.5			
Aroclor 1260	0.5			
Arsenic	10			
Atrazine	3			
Azobenzene (1,2-Diphenylhydrazine)				6.11
Barium	2,000			
Benzene	5			
Benzidine				0.00292
Benzo(a)anthracene				0.921
Benzo(a)pyrene	0.2			
Benzo(b)fluoranthene				0.921
Benzo(g,h,i)perylene				469
Benzo(k)fluoranthene				9.21
Benzoic acid				2.2
Benzyl alcohol				364
Beryllium	4			
Beta-BHC				0.374

Table 1-3
Groundwater Screening Criteria
Boeing Tract 1, St. Louis, Missouri

COC	MCL (ug/L)	Health Advisory (ug/L)	Sec. Std. (ug/L)	GW Target Level (ug/L)
Bis(2-chloroethoxy)methane				6.57E-04
Bis(2-chloroethyl)ether				0.124
Bis(2-ethylhexyl)phthalate	6			
Bromate	10			
Bromobenzene		4,000		
Bromochloromethane		90		
Bromodichloromethane		60		
Bromoform		400		
Bromomethane		10		
Butyl benzyl phthalate		7,000		
Cadmium	5			
Carbazole				7.08
Carbofuran	40			
Carbon disulfide				201
Carbon tetrachloride	5			
Chlordane	2			
Chloride			250,000	
Chlorite	1,000			
Chlorobenzene	100			
Chlorodibromomethane		40		
Chloroethane				48.8
Chloroform		400		
Chloromethane		30		
Chromium	100			
Chrysene				92.1
cis-1,3-Dichloropropene				0.482
cis-1,2-Dichloroethene	70			
Copper	1,300			
Cyanide, total	200			
Dalapon	200			
Delta-BHC				0.374
Di(2-ethylhexyl) adipate	400			
Di(2-ethylhexyl) phthalate	6			
Dibenzo(a,h)anthracene				0.0921
Dibenzofuran				5.99
Dibromochloromethane		40		
Dibromomethane				156
Dichlorodifluoromethane		1,000		
Dichloromethane	5			
Dieldrin		0.2		
Diethyl phthalate		30,000		
Di-isopropyl ether				0.439
Dimethyl phthalate				12,100
Di-n-butyl phthalate				1,560
Di-n-octyl phthalate				313
Dinoseb	7			
Dioxin (2,3,7,8-TCDD)	0.00003			
Diquat	20			
Endothall	100			

Table 1-3
Groundwater Screening Criteria
Boeing Tract 1, St. Louis, Missouri

COC	MCL (ug/L)	Health Advisory (ug/L)	Sec. Std. (ug/L)	GW Target Level (ug/L)
Endosulfan I				31.3
Endosulfan II				93.9
Endosulfan sulfate				93.9
Endrin	2			
Endrin aldehyde				4.69
Endrin ketone				4.69
Ethane				
Ethene				
Ethyl methacylate				1,410
Ethylbenzene	700			
Ethylene dibromide	0.05			
Ethylene glycol		14,000		
Fluoranthene				626
Fluorene		1,000		
Fluoride	4,000			
Gamma-BHC (Lindane)	0.2			
Gamma-Chlordane				1.92
Glyphosate	700			
Haloacetic acids (HAA5)	60			
Heptachlor	0.4			
Heptachlor epoxide	0.2			
Hexachlorobenzene	1			
Hexachlorobutadiene		1		
Hexachlorocyclopentadiene	50			
Hexachloroethane		1		
Indeno(1,2,3-cd)pyrene				0.921
Iodomethane				3.19
Iron			300	
Isophorone		100		
Isopropylbenzene (Cumene)		4,000		
Lead	15			
m,p-Xylene				185
Manganese, total			50	
Mercury	2			
Methacrylonitrile				1.56
Methoxychlor	40			
Methyl ethyl ketone (MEK)		4,000		
Methyl methacrylate				296
Methyl tert butyl ether				146
Methylene chloride				49.1
Naphthalene		100		
n-Butylbenzene				48.6
Nickel		100		
Nitrate as Nitrogen (Cadmium reduction)	10,000			
Nitrate-nitrite	10,000			
Nitrite (measured as nitrogen)	1,000			
Nitrobenzene				0.672
n-Nitrosodimethylamine				0.00287
n-Nitrosodi-n-propylamine				0.0202

Table 1-3
Groundwater Screening Criteria
Boeing Tract 1, St. Louis, Missouri

COC	MCL (ug/L)	Health Advisory (ug/L)	Sec. Std. (ug/L)	GW Target Level (ug/L)
n-Nitrosodiphenylamine				2.87E-03
n-Propylbenzene				5.27
o-Dichlorobenzene	600			
Oxamyl (Vydate)	200			
o-Xylene				185
PCB	0.5			
p-Dichlorobenzene	75			
Pentachlorophenol	1			
Phenanthrene				173
Phenol		4,000		
Picloram	500			
p-Isopropyltoluene				107
Propionitrile				1.51
Pyrene				469
Pyridine				1.21
sec-Butylbenzene				48.6
Selenium	50			
Silver			100	
Simazine	4			
Styrene	100			
Sulfate			250,000	
t-Butylbenzene				48.6
Tetrachloroethene	5			
Thallium	2			
Toluene	1,000			
Total Trihalomethanes (TTHMs)	80			
Toxaphene	3			
trans-1,2-Dichloroethene	100			
trans-1,3-Dichloropropene				4.41
trans-1,4-Dichloro-2-butene				0.0197
Trichloroethene	5			
Trichlorofluoromethane		2,000		
Vinyl acetate				86.4
Vinyl chloride	2			
Xylenes, Total	10,000			
Zinc		2,000		

Table 1-4
Representative Background Concentrations for Metals in Soils
Boeing Tract 1, St. Louis, Missouri

Metals	Background Concentration (ug//kg)	Reference
Aluminum	41,000,000*	MO
Antimony	520	US
Arsenic	9,200	StL
Barium	725,000	StL
Beryllium	800	MO
Cadmium	<1,000	MO
Calcium	3,300,000	MO
Chromium	58,000	StL
Cobalt	10,000	MO
Copper	13,000	MO
Iron	21,000,000*	MO
Lead	21,800	StL
Magnesium	2,600,000	MO
Manganese	740,000	MO
Mercury	39	StL
Nickel	14,000	MO
Potassium	14,000,000*	MO
Selenium	260	StL
Silver	<700	MO
Sodium	5,300,000*	MO
Thallium	<100	SLAPS
Vanadium	69,000	MO
Zinc	49,000	MO

Notes:

*: Arithmetic Mean

References:

StL - Mactec Engineering and Consulting, Inc., October 22, 2003, Draft RCRA Facility Investigation Report for McDonnell Douglas, Hazelwood, Missouri, Table 6-1 (St. Louis County Geometric Mean)

MO - Tidball, Ronald R., 1984, Geochemical Survey of Missouri, Geological Survey Professional Paper 954-H,I (Missouri Statewide Geometric Mean)

US - Shacklette, Hansford T. and Boerngen, Josephine G., 1984, U.S. Geological Survey Professional Paper 1270 (Eastern United States Geometric Mean)

SLAPS - Environmental Assessment Division, Argonne National Laboratory, November 1993, Baseline Risk Assessment for Exposure to Contaminants at the St. Louis Site, St. Louis, Missouri, Table 2.8

Table 1-5
Physical/Chemical Properties for Potential Constituents of Concern
Boeing Tract 1, St. Louis, Missouri

Chemicals of Concern	Molecular Weight (M)	Water Solubility (S) (mg/L)	Henry's Law Constant (H) (L-water/L-air)	Org. Carbon Adsorption Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. (K_d) (cm^3/g)	Molecular Diffusion Coefficient in air (D^a) (cm^2/s)	Molecular Diffusion Coefficient in water (D^w) (cm^2/s)
1,1,2-Trichloro-1,2,2-trifluoroethene	1.87E+02	1.70E+02	2.16E+01	3.72E+02	NA	2.88E-02	8.07E-06
1,2,3-Trimethylbenzene	1.20E+02	7.52E+01	1.33E-01	5.89E+02	NA	6.77E-02	7.41E-06
1,2,4-Trimethylbenzene	1.20E+02	5.70E+01	2.53E-01	3.72E+03	NA	7.50E-02	7.10E-06
1,3,5-Trimethylbenzene	1.20E+02	4.82E+01	3.60E-01	8.19E+02	NA	7.50E-02	7.10E-06
1,2-Dichlorobenzene	1.47E+02	1.56E+02	7.79E-02	6.17E+02	NA	6.90E-02	7.90E-06
2-Hexanone	1.00E+02	1.79E+04	3.38E-03	1.78E+01	NA	6.96E-02	7.75E-06
Acenaphthene	1.54E+02	4.24E+00	6.36E-03	7.08E+03	NA	4.21E-02	7.69E-06
Acenaphthylene	1.52E+02	3.93E+00	4.74E-03	6.92E+03	NA	4.39E-02	7.07E-06
Acetone	5.81E+01	1.00E+06	1.59E-03	5.75E-01	NA	1.24E-01	1.14E-05
Anthracene	1.78E+02	4.34E-02	2.95E-02	2.95E+04	NA	3.24E-02	7.74E-06
Aluminum	2.70E+01	NA	NA	NA	NA	NA	NA
Antimony	1.22E+02	NA	NA	NA	4.47E+01	NA	NA
Aroclor 1254	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	2.51E+01	NA	NA
Barium	NA	NA	NA	NA	1.10E+01	NA	NA
Benzene	7.81E+01	1.75E+03	2.28E-01	5.89E+01	NA	8.80E-02	9.80E-06
Benzo[g,h,i] perylene	2.76E+02	2.60E-04	5.82E-06	1.58E+06	NA	4.90E-02	5.65E-05
Benzo[a]anthracene	2.28E+02	9.40E-03	1.37E-04	3.98E+05	NA	5.10E-02	9.00E-06
Benzo[a]pyrene	2.52E+02	1.62E-03	4.63E-05	1.02E+06	NA	4.30E-02	9.00E-06
Benzo[b]fluoranthene	2.52E+02	1.50E-03	4.55E-03	1.23E+06	NA	2.26E-02	5.56E-06
Benzo[k]fluoranthene	2.52E+02	8.00E-04	3.40E-05	1.23E+06	NA	2.26E-02	5.56E-06
Beryllium	9.01E+00	NA	NA	NA	2.29E+01	NA	NA
Bromomethane	9.50E+01	1.50E+04	2.60E-01	9.00E+00	NA	7.30E-02	1.20E-05
Cadmium	1.12E+02	NA	NA	NA	1.51E+01	NA	NA
Carbazole	167	7.48E+00	6.27E-07	3.39E+03	NA	3.90E-02	7.03E-06
Carbon disulfide	76	1.19E+03	1.24E+00	4.57E+01		1.04E-01	1.00E-05
Chloroethane	6.50E+01	5.70E+03	4.50E-01	1.50E+01	NA	1.00E-01	1.20E-05
Chloroform	1.19E+02	7.92E+03	1.52E-01	3.98E+01	NA	1.04E-01	1.00E-05
Chromium (Total)	5.20E+01	NA	NA	NA	1.20E+03	NA	NA
Chromium, hexavalent	5.20E+01	NA	NA	NA	1.41E+01	NA	NA
Chrysene	2.28E+02	1.60E-03	3.88E-03	3.98E+05	NA	2.48E-02	6.21E-06
Cobalt	5.89E+01	NA	NA	NA	4.47E+01	NA	NA
Copper	6.35E+01	NA	NA	NA	3.98E+01	NA	NA
Cyanide, total	2.70E+01	1.00E+06	5.30E-03	1.70E+01	NA	1.80E-01	1.80E-05
Dibenzo[a,h]anthracene	2.78E+02	2.49E-03	6.03E-07	3.80E+06	NA	2.02E-02	5.18E-06
Dichlorodifluoromethane	1.20E+02	2.80E+02	4.10E+00	5.80E+01	NA	8.00E-02	1.10E-05
Dichloroethane, 1,1-	9.90E+01	5.10E+03	2.30E-01	3.20E+01	NA	7.40E-02	1.10E-05
Dichloroethylene, 1,1-	9.69E+01	2.25E+03	1.07E+00	5.89E+01	NA	9.00E-02	1.04E-05
Dichloroethylene, cis-1,2-	9.69E+01	3.50E+03	1.67E-01	3.55E+01	NA	7.36E-02	1.13E-05
Dichloroethylene, trans -1,2-	9.69E+01	6.30E+03	3.85E-01	5.25E+01	NA	7.07E-02	1.19E-05
Ethylbenzene	1.06E+02	1.69E+02	3.23E-01	3.63E+02	NA	7.50E-02	7.80E-06
Fluoranthene	2.02E+02	2.06E-01	6.60E-04	1.07E+05	NA	3.02E-02	6.35E-06
Fluorene	1.66E+02	1.98E+00	2.61E-03	1.38E+04	NA	3.63E-02	7.88E-06
Indeno[1,2,3-cd]pyrene	2.76E+02	2.20E-05	6.56E-05	3.47E+06	NA	1.90E-02	5.66E-06
Isopropylbenzene	1.20E+02	6.13E+01	3.57E+00	4.54E+02	NA	7.50E-02	7.10E-06
m/p-Xylene	1.06E+02	1.60E+02	3.05E-01	1.95E+02	NA	7.00E-02	7.80E-06
Manganese	5.49E+01	NA	NA	NA	5.01E+01	NA	NA
Mercury	4.01E+02	NA	4.67E-01	NA	5.25E+01	3.07E-02	6.30E-06
Methyl ethyl ketone (2-Butanone)	7.21E+01	2.23E+05	2.33E-03	4.50E+00	NA	8.95E-02	9.80E-06
Methyl isobutyl ketone	1.00E+02	1.90E+04	5.66E-03	1.34E+02	NA	7.50E-02	7.80E-06
Methyl tert butyl ether (MTBE)	8.82E+01	5.10E+04	2.41E-02	1.12E+01	NA	8.00E-02	1.00E-05

Table 1-5
Physical/Chemical Properties for Potential Constituents of Concern
Boeing Tract 1, St. Louis, Missouri

Chemicals of Concern	Molecular Weight (M)	Water Solubility (S) (mg/L)	Henry's Law Constant (H) (L-water/L-air)	Org. Carbon Adsorption Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. (K_d) (cm^3/g)	Molecular Diffusion Coefficient in air (D^a) (cm^2/s)	Molecular Diffusion Coefficient in water (D^w) (cm^2/s)
Methylene chloride	**8.49E+01**	**1.30E+04**	**8.98E-02**	**1.17E+01**	NA	**1.01E-01**	**1.17E-05**
Naphthalene	**1.28E+02**	**3.10E+01**	**1.98E-02**	**2.00E+03**	NA	**5.90E-02**	**7.50E-06**
n-Butylbenzene	1.30E+02	1.40E+01	5.40E-01	2.80E+03	NA	7.50E-02	7.80E-06
Nickel	**5.87E+01**	NA	NA	NA	*1.88E+01*	NA	NA
n-Propylbenzene	**1.20E+02**	**5.22E+01**	**4.31E-01**	**7.41E+02**	NA	**7.50E-02**	**7.80E-06**
o-Xylene	*1.06E+02*	*1.78E+02*	*7.36E-04*	*1.29E+02*	NA	*8.70E-02*	*1.00E-05*
Phenanthrene	*1.78E+02*	*9.94E-01*	*5.40E-03*	*1.41E+04*	NA	*3.33E-02*	*7.47E-06*
p-Isopropyltoluene	*1.34E+02*	*1.72E+01*	*4.66E-01*	*2.29E+03*	NA	*5.72E-02*	*6.73E-06*
Pyrene	**2.02E+02**	**1.35E-01**	**4.51E-04**	**1.05E+05**	NA	**2.72E-02**	**7.24E-06**
sec-Butylbenzene	1.30E+02	1.70E+01	7.70E-01	2.20E+03	NA	7.50E-02	7.80E-06
Selenium	**7.90E+01**	NA	NA	NA	*2.20E+00*	NA	NA
Silver	**1.08E+02**	NA	NA	NA	*1.00E-01*	NA	NA
t-Butylbenzene	1.30E+02	3.00E+01	5.20E-01	2.20E+03	NA	7.50E-02	7.80E-06
Tetrachloroethylene	**1.66E+02**	**2.00E+02**	**7.54E-01**	**1.55E+02**	NA	**7.20E-02**	**8.20E-06**
Thallium	*2.40E+02*	*2.90E+03*	NA	NA	*4.37E+01*	NA	NA
Toluene	**9.21E+01**	**5.26E+02**	**2.72E-01**	**1.82E+02**	NA	**8.70E-02**	**8.60E-06**
TPH-GRO							
Aliphatics C6 - C8	1.00E+02	5.40E+00	5.00E+01	3.98E+03	NA	1.00E-01	1.00E-05
Aliphatics C8 - C10	1.30E+02	4.30E-01	8.00E+01	3.16E+04	NA	1.00E-01	1.00E-05
Aromatics C8 - C10	1.20E+02	6.50E+01	4.80E-01	1.58E+03	NA	1.00E-01	1.00E-05
TPH-DRO							
Aliphatics C10 - C12	1.60E+02	3.40E-02	1.20E+02	2.51E+05	NA	1.00E-01	1.00E-05
Aliphatics C12 - C16	2.00E+02	7.60E-04	5.20E+02	5.01E+06	NA	1.00E-01	1.00E-05
Aliphatics C16 - C21	2.70E+02	2.50E-06	4.90E+03	6.31E+08	NA	1.00E-01	1.00E-05
Aromatics C10 - C12	1.30E+02	2.50E+01	1.40E-01	2.51E+03	NA	1.00E-01	1.00E-05
Aromatics C12 - C16	1.50E+02	5.80E+00	5.30E-02	5.01E+03	NA	1.00E-01	1.00E-05
Aromatics C16 - C21	1.90E+02	6.50E-01	1.30E-02	1.58E+04	NA	1.00E-01	1.00E-05
TPH-ORO							
Aliphatics C21 - C35	2.70E+02	2.50E-06	4.90E+03	6.31E+08	NA	1.00E-01	1.00E-05
Aromatics C21 - C35	2.40E+02	6.60E-03	6.70E-04	1.26E+05	NA	1.00E-01	1.00E-05
Trichloroethylene	**1.31E+02**	**1.10E+03**	**4.22E-01**	**1.66E+02**	NA	**7.90E-02**	**9.10E-06**
Vanadium	**5.09E+01**	NA	NA	NA	*1.00E+03*	*0.00E+00*	*0.00E+00*
Vinyl chloride	**6.25E+01**	**2.76E+03**	**1.11E+00**	**1.86E+01**	NA	**1.06E-01**	**1.23E-06**
Xylene	**1.06E+02**	**1.61E+02**	**3.01E-01**	**4.07E+02**	NA	**7.00E-02**	**7.80E-06**
Zinc	**6.54E+01**	NA	NA	NA	*1.58E+01*	NA	NA

Note:
NA: Not available

References:

Values in bold: Missouri Department of Natural Resources, Sep. 1998. Cleanup Levels for Missouri (CALM), Table A4 Effective Sep. 1, 2001.

Values in regular: EPA Region 9, April 2002. Preliminary Remediation Goals.

Values in italic: Texas Commission on Environmental Quality, Texas Risk Reduction Program, 2001.

TPH Criteria Working Group, June 1999. TPHCWG Series Volume 5: Human Health Risk-Based Evaluation of Petroleum Contaminated Sites: Implementation of the Working Group Approach.

Table 1-6
Toxicological Properties for Poential Constituents of Concern
Boeing Tract 1, St. Louis, Missouri

Chemicals of Concern	Slope Factor		Reference Dose		Oral RA Factor	Dermal RA Factor
	Oral (SF_o) (kg-day/mg)	Inh. (SF_i) (kg-day/mg)	Oral (R_fD_o) (mg/kg-day)	Inh. (R_fD_i) (mg/kg-day)	(RAF_o)	(RAF_d)
1,1,2-Trichloro-1,2,2-trifluoroethene	NA	NA	**3.00E+01**	**8.60E+00**	**1**	**0.3**
1,2,3-Trimethylbenzene	NA	NA	*5.00E-02*	*1.71E-03*	NA	NA
1,2,4-Trimethylbenzene	NA	NA	**5.00E-02**	**1.70E-03**	**1**	**0.3**
1,3,5-Trimethylbenzene	NA	NA	**5.00E-02**	**1.71E-03**	**1**	**0.3**
1,2-Dichlorobenzene	NA	NA	**9.00E-02**	**5.71E-02**	**0.5**	**0.3**
2-Hexanone	NA	NA	*6.00E-02*	*1.14E-03*	NA	NA
Acenaphthene	NA	NA	**6.00E-02**	6.00E-02	**1**	**0.3**
Acenaphthylene	NA	NA	*6.00E-02*	NA	NA	NA
Acetone	NA	NA	**1.00E-01**	1.00E-01	**0.95**	**0.3**
Aluminum	NA	NA	**1.00E+00**	**1.42E-03**	1	1
Anthracene	NA	NA	**3.00E-01**	3.00E-01	**1**	**0.3**
Antimony	NA	NA	**4.00E-04**	**5.70E-05**	**1**	**0.01**
Aroclor 1254	2.00E+00	2.00E+00	2.00E-05	2.00E-05	NA	0.14
Arsenic	**1.50E+00**	*1.50E+01*	**3.00E-04**	NA	**0.95**	**0.001**
Barium	NA	NA	**7.00E-02**	**1.40E-04**	**1**	**0.01**
Benzene	**2.90E-02**	**2.91E-02**	**3.00E-03**	**1.71E-03**	**1**	**0.3**
Benzo[g,h,i] perylene	NA	NA	*3.00E-02*	NA	NA	NA
Benzo[a]anthracene	7.30E-01	7.30E-01	NA	NA	**1**	**0.13**
Benzo[a]pyrene	**7.30E+00**	**6.09E+00**	NA	NA	**0.85**	**0.13**
Benzo[b]fluoranthene	7.30E-01	7.30E-01	NA	NA	**1**	**0.13**
Benzo[k]fluoranthene	7.30E-02	7.30E-02	NA	NA	**1**	**0.13**
Beryllium	**4.30E+00**	**8.40E+00**	**2.00E-03**	**5.71E-03**	**0.01**	**0.01**
Bromomethane	NA	NA	1.40E-03	1.40E-03	NA	NA
Cadmium	NA	**6.30E+00**	**5.00E-04**	NA	**1**	**0.01**
Carbazole	2.00E-02	2.00E-02	NA	NA	*7.00E-01*	1.00E-01
Carbon disulfide	NA	NA	1.00E-01	2.00E-01	*6.30E-01*	*NA*
Chloroethane	2.90E-03	2.90E-03	4.00E-01	2.90E+00	NA	NA
Chloroform	**6.10E-03**	**8.05E-02**	**1.00E-02**	**8.60E-05**	**1**	**0.3**
Chromium (Total)	NA	4.20E+01	NA	NA	NA	NA
Chromium, hexavalent	NA	**2.90E+02**	**3.00E-03**	NA	0.025	0.01
Chrysene	7.30E-03	7.30E-03	NA	NA	**1**	**0.13**
Cobalt	NA	9.80E+00	2.00E-02	5.70E-06	NA	NA
Copper	NA	NA	4.00E-02	*2.86E-04*	**1**	**0.01**
Cyanide, total	NA	NA	NA	NA	NA	NA
Dibenzo[a,h]anthracene	7.30E+00	7.30E+00	NA	NA	**1**	**0.13**
Dichlorodifluoromethane	NA	NA	2.00E-01	5.70E-02	NA	NA
Dichloroethane, 1,1-	NA	NA	1.00E-01	1.40E-01	NA	NA
Dichloroethylene, 1,1-	**6.00E-01**	**1.75E-01**	**9.00E-03**	5.70E-02	**1**	**0.3**
Dichloroethylene, cis-1,2-	NA	NA	**1.00E-02**	1.00E-02	**1**	**0.03**
Dichloroethylene, trans -1,2-	NA	NA	**2.00E-02**	2.00E-02	**1**	**0.03**
Ethylbenzene	NA	NA	**1.00E-01**	**2.86E-01**	**0.92**	**0.3**
Fluoranthene	NA	NA	**4.00E-02**	4.00E-02	**0.5**	**0.1**
Fluorene	NA	NA	**4.00E-02**	4.00E-02	**1**	**0.3**
Indeno[1,2,3-cd]pyrene	7.30E-01	7.30E-01	NA	NA	**1**	**0.13**
Isopropylbenzene	NA	NA	**1.00E-01**	**1.14E-01**	**1**	**0.3**
m/p-Xylene	NA	NA	*2.00E+00*	*1.22E-01*	NA	NA
Manganese	NA	NA	**1.40E-01**	**1.40E-05**	**1**	**0.3**
Mercury	NA	NA	**3.00E-04**	**8.60E-05**	**0.15**	**0.001**
Methyl ethyl ketone (2-Butanone)	NA	NA	**6.00E-01**	**2.86E-01**	**1**	**0.3**

Table 1-6
Toxicological Properties for Poential Constituents of Concern
Boeing Tract 1, St. Louis, Missouri

Chemicals of Concern	Slope Factor		Reference Dose		Oral RA Factor	Dermal RA Factor
	Oral (SF_o) (kg-day/mg)	Inh. (SF_i) (kg-day/mg)	Oral (R_fD_o) (mg/kg-day)	Inh. (R_fD_i) (mg/kg-day)	(RAF_o)	(RAF_d)
Methyl isobutyl ketone	NA	NA	**8.00E-02**	**2.29E-02**	1	0.30
Methyl tert butyl ether (MTBE)	3.30E-03	3.50E-04	8.60E-01	8.60E-01	**1**	**0.3**
Methylene chloride	**7.50E-03**	**1.65E-03**	**6.00E-02**	**8.57E-01**	**1**	**0.3**
Naphthalene	NA	NA	**2.00E-02**	**8.60E-04**	**0.84**	**0.3**
n-Butylbenzene	NA	NA	4.00E-02	4.00E-02	NA	NA
Nickel	NA	**8.40E-01**	**2.00E-02**	*5.71E-05*	**0.1**	**0.0005**
n-Propylbenzene	NA	NA	**1.00E-03**	4.00E-02	**1**	**0.3**
o-Xylene	NA	NA	*2.00E+00*	*1.22E-01*	NA	NA
Phenanthrene	NA	NA	*3.00E-02*	NA	NA	NA
p-Isopropyltoluene	NA	NA	*1.00E-01*	*8.57E-02*	NA	NA
Pyrene	NA	NA	**3.00E-02**	3.00E-02	**1**	**0.1**
sec-Butylbenzene	NA	NA	4.00E-02	4.00E-02	NA	NA
Selenium	NA	NA	**5.00E-03**	*5.70E-05*	**1**	**0.1**
Silver	NA	NA	**5.00E-03**	*2.86E-06*	**1**	**0.3**
t-Butylbenzene	NA	NA	4.00E-02	4.00E-02	NA	NA
Tetrachloroethylene	**5.20E-02**	**2.03E-03**	**1.00E-02**	**1.14E-01**	**1**	**0.03**
Thallium	NA	NA	**8.00E-05**	NA	**1**	**0.01**
Toluene	NA	NA	**2.00E-01**	**1.14E-01**	**1**	**0.03**
TPH-GRO						
Aliphatics C6 - C8	NA	NA	5.00E+00	5.26E+00	1	NA
Aliphatics C8 - C10	NA	NA	1.00E-01	2.86E-01	1	NA
Aromatics C8 - C10	NA	NA	4.00E-02	5.71E-02	1	NA
TPH-DRO						
Aliphatics C10 - C12	NA	NA	1.00E-01	2.86E-01	1	*0.1*
Aliphatics C12 - C16	NA	NA	1.00E-01	2.86E-01	1	*0.1*
Aliphatics C16 - C21	NA	NA	2.00E+00	2.86E-01	1	*0.1*
Aromatics C10 - C12	NA	NA	4.00E-02	5.70E-02	1	*0.1*
Aromatics C12 - C16	NA	NA	4.00E-02	5.70E-02	1	*0.1*
Aromatics C16 - C21	NA	NA	3.00E-02	5.70E-02	1	*0.13*
TPH-ORO						
Aliphatics C21 - C35	NA	NA	2.00E+00	2.86E-01	1	*0.1*
Aromatics C21 - C35	NA	NA	3.00E-02	5.70E-02	1	0.13
Trichloroethane, 1,1,1-	NA	NA	**2.00E-02**	**2.86E-01**	**1**	**0.0005**
Trichloroethylene	**1.10E-02**	**5.95E-03**	**6.00E-03**	1.00E-02	**1**	**0.0005**
Vinyl chloride	**1.90E+00**	**2.95E-01**	*3.00E-03*	*2.90E-02*	**1**	**0.0003**
Xylene	NA	NA	**2.00E+00**	**2.00E-01**	**0.92**	**0.3**
Vanadium	NA	NA	**7.00E-03**	NA	1	0.01
Zinc	NA	NA	**3.00E-01**	NA	**0.25**	**0.01**

Notes:
NA: Not available
For chemicals which oral and dermal RA factors were not available, 1.0 was used for risk calculation.

References:
Values in bold: Missouri Department of Natural Resources, Sep. 1998. Cleanup Levels for Missouri (CALM), Table A3 Effective Sep. 1, 2001.
Values in regular: EPA Region 9, April 2002. *Preliminary Remediation Goals.*
Values in italic: Texas Commission on Environmental Quality, Texas Risk Reduction Program, 2001.
TPH Criteria Working Group, June 1999. TPHCWG Series Volume 5: Human Health Risk-Based Evaluation of Petroleum Contaminated Sites: Implementation of the Working Group Approach.

Table 1-7
Exposure Factors Used to Estimate Risk
Boeing Tract 1, St. Louis, Missouri

Parameter	Symbol	Unit	Values Used
Averaging Time for Carcinogen	AT_c	year	70
Averaging Time for Non-Carcinogen	AT_{nc}	year	=ED
Body Weight:			
Non-Residential Worker	BW	kg	70
Construction Worker	BW	kg	70
Exposure Duration:			
Non-Residential Worker	ED	year	25
Construction Worker	ED	year	1
Exposure Time for Dermal Contact with Groundwater:			
Non-Residential Worker	ETd	hr/day	1
Construction Worker	ETd	hr/day	4
Exposure Frequency:			
Non-Residential Worker	EF	day/year	250
Construction Worker	EF	day/year	30
Soil Ingestion Rate:			
Non-Residential Worker	IR_{soil}	mg/day	100
Construction Worker	IR_{soil}	mg/day	330
Groundwater Ingestion Rate:			
Non-Residential Worker	IR_w	L/day	2
Indoor Inhalation Rate (hourly):			
Non-Residential Worker	IR_{ai}	m^3/hr	0.833
Exposure Time for Indoor Inhalation:			
Non-Residential Worker	ET_{in}	hr/day	18
Indoor Inhalation Rate (daily):			
Non-Residential Worker	IRa	m^3/day	15.0
Outdoor Inhalation Rate (hourly):			
Non-Residential Worker	IR_{ao}	m^3/hr	0.833
Construction Worker	IR_{ao}	m^3/hr	0.833
Exposure Time for Outdoor Inhalation:			
Non-Residential Worker	ET_{out}	hr/day	6
Construction Worker	ET_{out}	hr/day	8
Outdoor Inhalation Rate (daily):			
Non-Residential Worker	IRa	m^3/day	5.0
Construction Worker	IRa	m^3/day	6.7
Skin Surface Area for Dermal Contact with Soil:			
Non-Residential Worker	SA	cm^2/day	3300
Construction Worker	SA	cm^2/day	3300
Skin Surface Area for Dermal Contact with Groundwater:			
Non-Residential Worker	SA	cm^2/day	4714
Construction Worker	SA	cm^2/day	4714
Soil to Skin Adherence Factor:			
Non-Residential Worker	M	mg/cm^3	0.2
Construction Worker	M	mg/cm^2	0.3
Target Risk Level	TR	--	1.00E-05
Target Hazard Quotient	THQ	--	1

Table 1-8
Fate and Transport Parameters Used to Estimate Risk
Boeing Tract 1, St. Louis, Missouri

Parameter	Symbol	Unit	Values Used	Comment
SOIL PARAMETERS:				
Soil Source Dimension Parallel to Wind Direction	W_u	cm		Area Specific
Depth to Subsurface Soil Sources	d_{ts}	cm		Area Specific
Depth of Surficial Soil Zone	d_s	cm	91.44	MDNR Default
VADOSE ZONE:				
Total Soil Porosity	θ_T	cm^3/cm^3-soil	0.48	Facility Specific
Volumetric Water Content	θ_{ws}	cm^3/cm^3	0.316	Facility Specific
Volumetric Air Content	θ_{as}	cm^3/cm^3	0.114	Calculated
Thickness	h_v	cm		Calculated
Dry Soil Bulk Density	ρ_s	g/cm^3	1.52	Facility Specific
Fractional Organic Carbon Content	f_{ocv}	g-C/g-soil	0.0477	Facility Specific
SOIL IN CRACKS:				
Total Soil Porosity (set equal to q_T)	θ_{Tcrack}	cm^3/cm^3-soil	0.480	Same as Vadose Zone
Volumetric Water Content	θ_{wcrack}	cm^3/cm^3	0.316	Same as Vadose Zone
Volumetric Air Content	θ_{acrack}	cm^3/cm^3	0.114	Same as Vadose Zone
CAPILLARY FRINGE:				
Total Soil Porosity (set equal to q_T)	θ_{Tcap}	cm^3/cm^3-soil	0.48	Same as Vadose Zone
Volumetric Water Content	θ_{wcap}	cm^3/cm^3		Calculated
Volumetric Air Content	θ_{acap}	cm^3/cm^3		Calculated
Thickness	h_c	cm		Area Specific
GROUNDWATER PARAMETERS:				
Depth to Groundwater	L_{gw}	cm		Area Specific
AMBIENT AIR PARAMETERS:				
Breathing Zone Height	δ_a	cm	200	MDNR Default
Inverse of Mean Concentration at Center of Square Source	Q/C	$(g/m^2\text{-}s)/(kg/m^3)$	81.64	MDNR Default
Fraction of Vegetative Cover	V	m^2/m^2	0.5	MDNR Default
Mean Annual Wind Speed	U_m	m/s	9.85	Facility Specific
Equivalent Threshold Value of Windspeed	U_t	m/s	11.32	MDNR Default
Windspeed Distribution Function from Cowherd et. al, 1985	F(x)	unitless	0.194	MDNR Default
ENCLOSED SPACE PARAMETERS:				
Enclosed Space Air Exchange Rate:				
Non-Residential Structure	ER	1/sec	0.00023	MDNR Default
Enclosed Space Volume/Infiltration Area Ratio:				
Non-Residential Structure	L_B	cm		Area Specific
Enclosed Space Foundation or Wall Thickness:				
Non-Residential Structure	L_{crack}	cm	25	Facility Specific
Area Fraction of Cracks in Foundation/Walls:				
Non-Residential Structure	h	cm^2/cm^2	0.001	MDNR Default
AVERAGING TIME FOR VAPOR FLUX:				
Non-Residential Worker	τ	sec	7.88E+08	MDNR Default
Construction Worker	τ	sec	3.15E+07	MDNR Default

Notes:
Facility specific: Applicalble to all areas and subareas.

Table 1-9
Soil Source Dimension Parallel to Wind Direction and Depth to Subsurface Soil
Boeing Tract 1, St. Louis, Missouri

Area	Soil Source Dimension Parallel to Wind Direction (ft)	Depth to Subsurface Soil (ft)
Area 1	1500	NA
Sub-area 2A	525	4.3
Sub-area 2B	480	5.6
Sub-area 2C	600	5.1*
Sub-area 3A	495	4.0*
Sub-area 3B	210	4.0*
Sub-area 3C	885	4.0*
Sub-area 3D	1305	6.4
Sub-area 3E	240	7.5
Sub-area 3F	165	NA
Sub-area 3G	210	6.7*
Sub-area 3H	240	9.5*
Area 4	495	3.0
Area 5	285	10.0
Sub-area 6A	1380	8.3*
Sub-area 6B	975	4.0
Sub-area 6C	1635	6.0
Sub-area 6D	900	7.0
Area 7	1425	NA
Sub-area 8A	600	2.5
Sub-area 8B	690	6.3*
Sub-area 8C	615	4.4*
Area 9	615	12.0

* : Depth to groundwater since sample was collected below groundwater table.
NA: Not applicable.

Table 1-10
Fractional Organic Carbon
Boeing Tract 1, St. Louis, Missouri

Sample ID	Fractional Organic Carbon (g/cc)
B10W1-8*	0.023
B5E2-6*	0.037
B1W1-8*	0.083
B42S7-8	0.032
B42N3-4	0.028
Average	**0.0477**

Notes:

* Used for risk calculation. Other samples had low level VOC impacts.

g/cc: grams per cubic centimeter

Table 1-11
Moisture Content
Boeing Tract 1, St. Louis, Missouri

Area/Sub-area	Ave. GW Depth	Sample ID	Sample Depth (ft)	Moisture Content (%)
2A	6.6	B51W4-6	6	22.33
2C	5.1	MW-6-2	2	18.8
3A	4.0	B42N3-4	4	22.49
3A	4.0	MW-4-2	2	22.9
3A	4.0	MW-4-2 DUP	2	22.7
3B	4.0	B42E3-4	4	19.9
3D	6.7	B2N6-6	6	21.47
3D	6.7	B2N7-6	6	21.22
3E	9.5	B2E2-8	8	21.56
4	9.5	B5E1-6	6	20.9
4	9.5	B5E2-6	6	21
4	9.5	MW-8-2	2	20
6A	8.3	RR2-3	3	9.8
6B	4.8	B22N1-4	4	15.6
6B	4.8	B27W1-3	3	21.5
6B	4.8	B27W3-2	2	20.3
6B	4.8	RC9-4	4	20.5
6C	10.0	B20E1-6	6	23.5
6C	10.0	B20E2-8	8	22.9
6C	10.0	B27E1-9	9	20.2
6C	10.0	B27E1-9 DUP	9	20.4
6C	10.0	B27I10-9	9	20.9
6C	10.0	B27I11-9	9	20.6
6C	10.0	B27I4-5	5	19.3
6C	10.0	B27I6-8	8	20.7
6C	10.0	B27I6-8 DUP	8	27.4
6C	10.0	B27I7-3	3	24.7
6C	10.0	B27I9-9	9	21.7
6C	10.0	B27S1-5	5	21.5
6C	10.0	B27S2-8	8	21.6
6C	10.0	RR3-2	2	21.3
6C	10.0	RR4-3	3	22.4
6D	9.1	EPE1-2	2	19
6D	9.1	EPE2-2	2	18.4
6D	9.1	SEWER-5	5	18.7
Average				**20.8**

Table 1-12
Dry Bulk Density
Boeing Tract 1, St. Louis, Missouri

Sample ID	Dry Bulk Density		Depth
	(lb/ft^3)	(g/cc)	(ft bgs)
MW-5AD	105.2	1.68	29-30
MW-5AD	116.5	1.86	75-76
MW-8AD	93.6	1.50	39-41
MW-8AD	104.1	1.67	64-66
MW-8AS*	95.2	1.52	10-12
MW-11S*	95.3	1.52	9-11
MW-11I	100.9	1.61	36-38
MW-11D	108.4	1.73	59-60
Average	**95.25**	**1.52**	

Note:

* Used for risk calculation. Other samples were at depths not representative of the shallow soil zone.

Table 1-13
Depth to Groundwater
Boeing Tract 1, St. Louis, Missouri

Area	Date	Depth to Groundwater (ft btoc)	Well ID
Area 1	12/17/2002	6.39	B45CMW-3A
	12/17/2002	4.9	B45CMW-3B
	12/17/2002	8.95	MW-A1
	6/23/2003	8.73	MW-A17
	12/17/2002	5.43	MW-A22
	3/21/2003	4.04	MW-A22
	6/23/2003	3.96	MW-A22
	12/17/2002	7.43	MW-A27
	3/21/2003	3.52	MW-A27
	6/23/2003	4.55	MW-A27
	12/17/2002	7.26	MW-A28
	6/23/2003	3.64	MW-A3
	Average	**5.73**	
	Value Used for Risk Calculation*	**6.1**	
Sub-area 2A & 2B*	12/17/2002	7.65	MW-10S
	8/16/2002	6.35	MW-11S
	12/17/2002	6.58	MW-11S
	3/21/2003	7.46	MW-11S
	6/23/2003	7.44	MW-11S
	12/17/2002	4.56	MW-6S
	8/16/2002	6.39	MW-8S
	12/17/2002	8.86	MW-8S
	3/21/2003	5.22	MW-8S
	6/23/2003	6.32	MW-8S
	8/16/2002	4.79	MW-9S
	12/17/2002	7.06	MW-9S
	3/21/2003	4.49	MW-9S
	6/23/2003	3.96	MW-9S
	Average	**6.22**	
	Value Used for Risk Calculation*	**6.6**	
Sub-area 2C	12/17/2002	4.38	MW-A12
	12/17/2002	5.1	MW-A13
	3/21/2003	4.96	MW-A13
	6/23/2003	4.35	MW-A13
	Average	**4.70**	
	Value Used for Risk Calculation*	**5.1**	
Sub-areas 3A, 3B, & 3C	12/17/2002	4.45	B41MW-18
	3/21/2003	3.23	B41MW-18
	6/23/2003	4.11	B41MW-18
	12/17/2002	4.54	B41MW-5
	3/21/2003	3.34	B41MW-5
	6/23/2003	2.97	B41MW-5
	12/17/2002	2.8	B41MW-7
	Average	**3.63**	
	Value Used for Risk Calculation*	**4.0**	
Sub-areas 3D, 3F, & 3G**	**Value Used for Risk Calculation***	**6.7**	

Table 1-13
Depth to Groundwater
Boeing Tract 1, St. Louis, Missouri

Area	Date	Depth to Groundwater (ft btoc)	Well ID
Area 4 and Sub-areas 3E & 3H	12/17/2002	9.63	B4MW-9
	3/21/2003	8.81	B4MW-9
	6/23/2003	9.01	B4MW-9
	7/29/2003	9.09	B5MW-22
	8/26/2003	8.96	B5MW-22
	Average	9.10	
	Value Used for Risk Calculation*	9.5	
Areas 5 & 9***	Value Used for Risk Calculation*	12.0	
Sub-area 6A	8/16/2002	8.42	MW1
	12/16/2002	8.47	MW1
	3/21/2003	7.42	MW1
	6/23/2003	7.41	MW1
	Average	7.93	
	Value Used for Risk Calculation*	8.3	
Sub-area 6B	8/16/2002	3.86	B28MW1
	12/16/2002	5.44	B28MW1
	3/21/2003	4.37	B28MW1
	6/23/2003	4.35	B28MW1
	12/16/2002	5.07	B28MW2
	12/16/2002	4.28	B28MW3
	8/16/2002	4.51	MW3
	12/16/2002	5.39	MW3
	3/21/2003	5.86	MW3
	6/23/2003	2.27	MW3
	12/16/2002	3.16	MW3A
	12/16/2002	5.27	MW3B
	8/16/2002	2.76	MW7
	12/16/2002	2.45	MW7
	3/21/2003	2.25	MW7
	6/23/2003	2.49	MW7
	8/16/2002	5.64	MW9S
	12/16/2002	7.11	MW9S
	3/21/2003	6.55	MW9S
	6/23/2003	5.76	MW9S
	Average	4.44	
	Value Used for Risk Calculation*	4.8	
Sub-area 6C	8/16/2002	11.27	MW5AS
	12/16/2002	11.97	MW5AS
	3/21/2003	11.48	MW5AS
	6/23/2003	10.61	MW5AS
	12/16/2002	9.06	MW5BS
	12/16/2002	13.03	MW5CS
	8/16/2002	8.26	MW5DS
	12/16/2002	8.38	MW5DS
	3/21/2003	8.74	MW5DS
	6/24/2003	7.64	MW5DS
	8/16/2002	9.58	MW8
	12/16/2002	10.19	MW8
	3/21/2003	9.29	MW8
	6/23/2003	3.69	MW8
	12/16/2002	11.57	MW8AS
	Average	9.65	
	Value Used for Risk Calculation*	10.0	

Table 1-13
Depth to Groundwater
Boeing Tract 1, St. Louis, Missouri

Area	Date	Depth to Groundwater (ft btoc)	Well ID
Sub-area 6D	8/16/2002	9.28	MW6
	12/16/2002	11.36	MW6
	3/21/2003	5.58	MW6
	6/23/2003	8.5	MW6
	Average	**8.68**	
	Value Used for Risk Calculation*	**9.1**	
Area 7	8/16/2002	4.42	MW2
	12/16/2002	5.78	MW2
	3/21/2003	4.89	MW2
	6/23/2003	4.61	MW2
	Average	**4.93**	
	Value Used for Risk Calculation*	**5.3**	
Sub-areas 8A & 8C	8/12/2002	3.96	MW10S
	12/16/2002	4.2	MW10S
	3/21/2003	4.4	MW10S
	6/23/2003	3.69	MW10S
	Average	**4.06**	
	Value Used for Risk Calculation*	**4.4**	
Sub-area 8B	12/16/2002	6.25	MW4
	6/23/2003	5.61	MW4
	Average	**5.93**	
	Value Used for Risk Calculation*	**6.3**	

Notes:

* Value used for risk calculation is 0.37 ft greater than average for top of casing correction. This correction is based on the average of the difference between ground surface elevations and the top of casing (TOC) elevations for selected monitoring wel

** For Sub-areas 3D, 3F, and 3G; the average of the depths selected for Sub-areas 3A, 3B, & 3C (3.63 feet) and for Sub-areas 3E & 3H (9.1 feet) was used. Therefore, 6.7 feet was used for Sub-areas 3D, 3F, and 3G including the 0.37 foot correction factor

*** For Areas 5 and 9, an average depth to groundwater of 12 feet was used. This was based on the depths at which "wet" or "saturated soil conditions were encounted as noted on the boring logs for these two areas as a group. There are no monitoring well

ft btoc - feet below top of casing

Table 1-14
Classification of TPH
Boeing Tract 1, St. Louis, Missouri

TPH	Classification
#6 Fuel Oil (C10-C32)	TPH-ORO
Diesel	TPH-DRO
Diesel #1	TPH-DRO
Diesel #2	TPH-DRO
Diesel (C7-C26)	TPH-DRO
Gasoline	TPH-GRO
Gasoline (C6-C14)	TPH-GRO
Gasoline Range Organics	TPH-GRO
Hydraulic Fluid (C12-C33)	TPH-ORO
Kerosene	TPH-DRO
Kerosene (C9-C16)	TPH-DRO
Mineral Spirits	TPH-DRO
Mineral Spirits (C7-C14)	TPH-DRO
Misc_TPH (C10-C40)	TPH-DRO
Miscellaneous	TPH-DRO
Miscellaneous as Diesel Fuel	TPH-DRO
Motor Oil	TPH-ORO
Motor Oil (C16-C33)	TPH-ORO
Stoddard Solvent	TPH-DRO
TPH	TPH-ORO
TPH (GC/FID) High Fraction	TPH-DRO
TPH (GC/FID) Low Fraction	TPH-GRO
TPH as Diesel	TPH-DRO
TPH as Gasoline	TPH-GRO
TPH as Hydraulic Fluid	TPH-ORO
TPH as Jet Fuel	TPH-DRO
TPH as Kerosene	TPH-DRO
TPH as Mineral Spririts	TPH-DRO
TPH as Motor Oil	TPH-ORO
Volatile Petroleum Hydrocarbons	TPH-GRO

Table 1-15
Groundwater TPH Ratios
Boeing Tract 1, St. Louis, Missouri

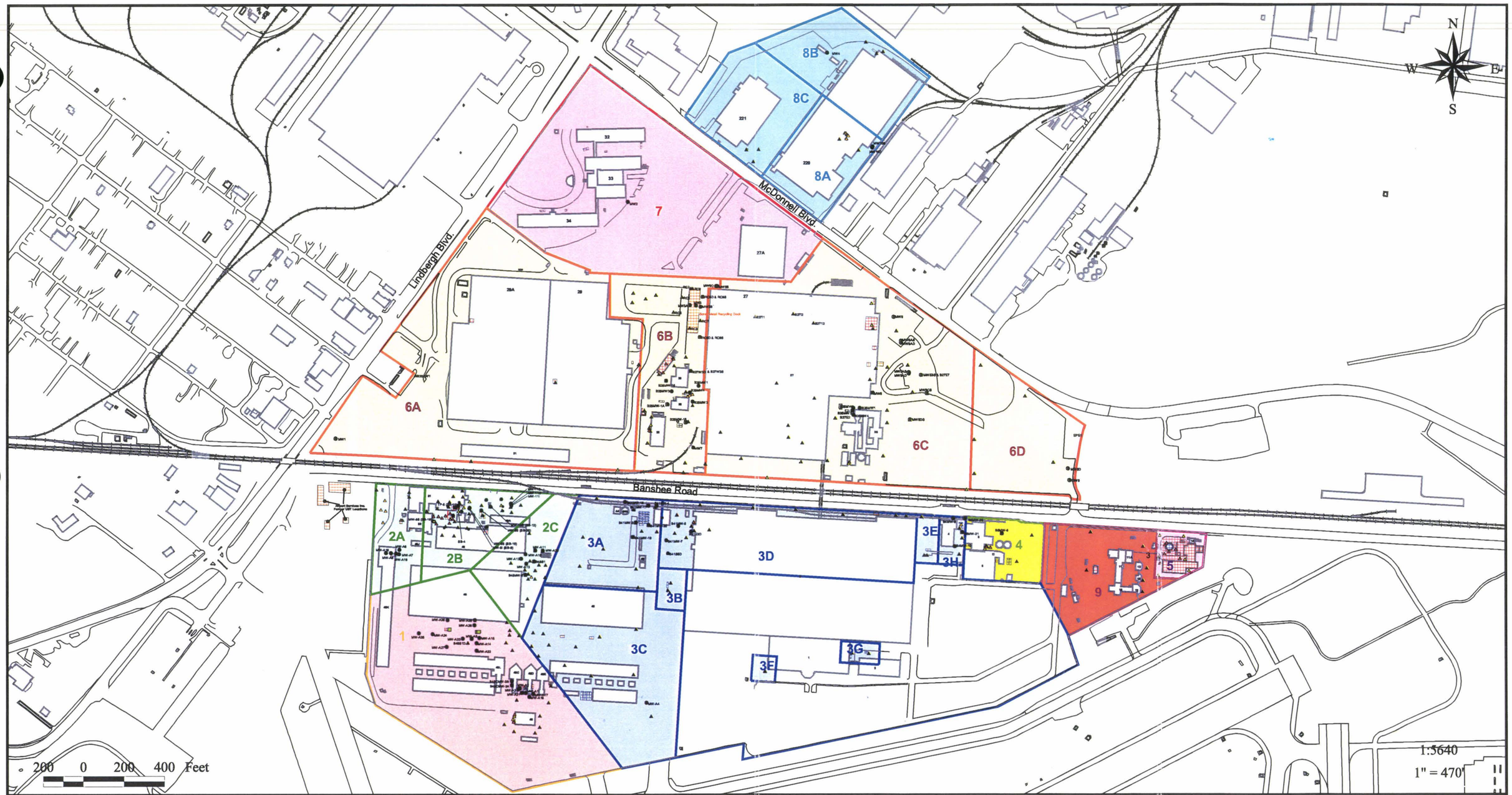
TPH	Area 2					Area 3					
	Sub-area 2B			Average Ratio	Average Conc * Ratio	Sub-area 3B	Average Conc * Ratio	Sub-area 3E	Average Conc * Ratio	Sub-area 3G	Average Conc * Ratio
TPH-ORO	MW-10S-04	TP-24-04	TP-9-04		15814	B42E1W	271	B2E2W	4850	B2S2W	3040
Aliphatics >nC21 to nC35 (TX1006)	500	4000	50		8786	250	136	250	373	2000	2432
Aromatics >nC21 to nC35 (TX1006)	500	2000	50		7028	250	136	3000	4477	500	608
Total TPH-ORO	**1000**	**6000**	**100**			**500**		**3250**		**2500**	
Ratio of Aliphatics >nC21 to nC35 (TX1006)/Total TPH-ORO	0.50	0.67	0.50	0.56		0.5		0.08		0.8	
Ratio of Aromatics >nC21 to nC35 (TX1006)/Total TPH-ORO	0.50	0.33	0.50	0.44		0.5		0.92		0.2	
TPH-DRO					219968		529		50025		2000
Aliphatics >nC10 to nC12 (TX1006)	4000	250	500		17717	250	88	250	8338	250	222
Aliphatics >nC12 to nC16 (TX1006)	12000	1000	2000		63149	250	88	250	8338	1000	889
Aliphatics >nC16 to nC21 (TX1006)	18000	1000	2000		74726	250	88	250	8338	250	222
Aromatics >nC10 to nC12 (TX1006)	500	250	200		8107	250	88	250	8338	250	222
Aromatics >nC12 to nC16 (TX1006)	500	500	2000		30484	250	88	250	8338	250	222
Aromatics >nC16 to nC21 (TX1006)	3000	500	1000		25786	250	88	250	8338	250	222
Total TPH-DRO	**38000**	**3500**	**7700**			**1500**		**1500**		**2250**	
Ratio of Aliphatics >nC10 to nC12 (TX1006)/Total TPH-DRO	0.11	0.07	0.06	0.08		0.167		0.17		0.11	
Ratio of Aliphatics >nC12 to nC16 (TX1006)/Total TPH-DRO	0.32	0.29	0.26	0.29		0.167		0.17		0.44	
Ratio of Aliphatics >nC16 to nC21 (TX1006)/Total TPH-DRO	0.47	0.29	0.26	0.34		0.167		0.17		0.11	
Ratio of Aromatics >nC10 to nC12 (TX1006)/Total TPH-DRO	0.01	0.07	0.03	0.04		0.167		0.17		0.11	
Ratio of Aromatics >nC12 to nC16 (TX1006)/Total TPH-DRO	0.01	0.14	0.26	0.14		0.167		0.17		0.11	
Ratio of Aromatics >nC16 to nC21 (TX1006)/Total TPH-DRO	0.08	0.14	0.13	0.12		0.167		0.17		0.11	
TPH-GRO					10123		3328		29500		5040
Aliphatics > nC6 to nC8 (TX1006)	500	250	250		4660	1000	2219	250	4917	250	1680
Aliphatics >nC8 to nC10 (TX1006)	500	250	50		2732	250	555	250	4917	250	1680
Aromatics >nC8 to nC10 (TX1006)	500	250	50		2732	250	555	1000	19667	250	1680
Total TPH-GRO	**1500**	**750**	**350**			**1500**		**1500**		**750**	
Ratio of Aliphatics > nC6 to nC8 (TX1006)/Total TPH-GRO	0.33	0.33	0.71	0.46		0.667		0.17		0.33	
Ratio of Aliphatics >nC8 to nC10 (TX1006)/Total TPH-GRO	0.33	0.33	0.14	0.27		0.167		0.17		0.33	
Ratio of Aromatics >nC8 to nC10 (TX1006)/Total TPH-GRO	0.33	0.33	0.14	0.27		0.167		0.67		0.33	

Note:
All concentrations are in micrograms per liter (ug/L).

Table 1-15
Groundwater TPH Ratios
Boeing Tract 1, St. Louis, Missouri

TPH	Area 6						Area 8	
	Sub-area 6B	Average Conc * Ratio	Sub-area 6C		Average Conc * Ratio	Mactech Avg *Avg.Ratios	Sub-area 8B	Average Conc * Ratio
TPH-ORO	RC2W	150	B27E2W	B27I9W		1022	B220N1W	32000
Aliphatics >nC21 to nC35 (TX1006)	250	75	250	3000		727	50000	22857
Aromatics >nC21 to nC35 (TX1006)	250	75	250	250		295	20000	9143
Total TPH-ORO	**500**		**500**	**3250**			**70000**	
Ratio of Aliphatics >nC21 to nC35 (TX1006)/Total TPH-ORO	0.5		0.5	0.92	0.71		0.71	
Ratio of Aromatics >nC21 to nC35 (TX1006)/Total TPH-ORO	0.5		0.5	0.08	0.29		0.29	
TPH-DRO		33451				12575		49500
Aliphatics >nC10 to nC12 (TX1006)	250	5575	250	250		1497	250	467
Aliphatics >nC12 to nC16 (TX1006)	250	5575	250	2000		4641	5000	9340
Aliphatics >nC16 to nC21 (TX1006)	250	5575	250	250		1497	15000	28019
Aromatics >nC10 to nC12 (TX1006)	250	5575	250	250		1497	250	467
Aromatics >nC12 to nC16 (TX1006)	250	5575	250	500		1946	2000	3736
Aromatics >nC16 to nC21 (TX1006)	250	5575	250	250		1497	4000	7472
Total TPH-DRO	**1500**		**1500**	**3500**			**26500**	
Ratio of Aliphatics >nC10 to nC12 (TX1006)/Total TPH-DRO	0.17		0.17	0.071	0.12		0.01	
Ratio of Aliphatics >nC12 to nC16 (TX1006)/Total TPH-DRO	0.17		0.17	0.571	0.37		0.19	
Ratio of Aliphatics >nC16 to nC21 (TX1006)/Total TPH-DRO	0.17		0.17	0.071	0.12		0.57	
Ratio of Aromatics >nC10 to nC12 (TX1006)/Total TPH-DRO	0.17		0.17	0.071	0.12		0.01	
Ratio of Aromatics >nC12 to nC16 (TX1006)/Total TPH-DRO	0.17		0.17	0.143	0.15		0.08	
Ratio of Aromatics >nC16 to nC21 (TX1006)/Total TPH-DRO	0.17		0.17	0.071	0.12		0.15	
TPH-GRO		996				203		250
Aliphatics > nC6 to nC8 (TX1006)	4000	885	1500	250		110	250	83
Aliphatics >nC8 to nC10 (TX1006)	250	55	250	250		47	250	83
Aromatics >nC8 to nC10 (TX1006)	250	55	250	250		47	250	83
Total TPH-GRO	**4500**		**2000**	**750**			**750**	
Ratio of Aliphatics > nC6 to nC8 (TX1006)/Total TPH-GRO	0.89		0.75	0.33	0.54		0.33	
Ratio of Aliphatics >nC8 to nC10 (TX1006)/Total TPH-GRO	0.06		0.125	0.33	0.23		0.33	
Ratio of Aromatics >nC8 to nC10 (TX1006)/Total TPH-GRO	0.06		0.125	0.33	0.23		0.33	

Note:
All concentrations are in micrograms per liter (ug/L).



Legend

- Abandoned Shallow Piezometer
- Abandoned Shallow Well
- Deep Piezometer
- Deep Well
- Intermediate Well
- Other Shallow Boring
- RFA Boring
- RCRA Closure Shallow Boring
- RFI Deep Boring/Temp. Piezometer
- RFI Shallow Boring
- RFI Shallow Boring/Temp. Piezometer
- Shallow Piezometer
- Shallow Well
- UST Closure Sample
- Other Area
- UST
- SWMU

Drawn by: BSM Approved by:

Checked by: Date: September 10, 2004

Risk Assessment & Management Group, Inc.

Figure 1-1
Risk Assessment Exposure Area Map, Boeing Tract 1 (North and South)

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Section
2.0

2.1 INTRODUCTION

The Runway Protection Zone, also referred to as Area 1, is located in the southern portion of the Facility, adjacent to the current runway (see Figure 2-1). This section describes the constituents in this Area, the exposure model, the evaluation of the current and future risk to human health and the environment, and conclusions based on the results of the risk evaluation. Note the risk was calculated using both the maximum and average concentrations, based on a request by the MDNR. The risks were acceptable using the average concentrations as presented in the draft risk assessment report submitted in December 2003. However, the MDNR requested that the risk be recalculated using the maximum concentrations.

2.2 DESCRIPTION OF AREA

The Runway Protection Zone is an Area approximately 1,500 feet long by 600 feet wide. Within this Area, there were 23 buildings or structures, in addition to portions of two buildings, and a small parking lot. All buildings within this Area will be demolished during construction of the St. Louis Airport expansion project and the Area will become a Runway Protection Zone. As per FAA regulations, no buildings can be built in a runway protection zone. This Area is currently paved and will remain paved.

2.2.1 Potential Sources within Area

The following five SWMUs were identified in this Area during the RFA investigation (SAIC, 1995):

- SWMU 12: Waste jet aircraft fuel and hydraulic system spillage (UST B28 2,130-gallon waste fuel/hydraulic oil UST);
- SWMU 13: 3,380-gallon waste jet fuel and hydraulic fluid USTs (B26 and B27);
- SWMU 14: Two 2,000-gallon waste jet fuel USTs. Fuel pits #3 and #4 (B29 and B30);
- SWMU 23: Less than 90 day storage area with capacity for twenty-eight 55-gallon drums for waste solvents, paints, and oils; and
- SWMU 26: Former less than 90-day storage area with capacity for twenty-eight 55-gallon drums for waste solvents, paints, and oils.

Including those noted above, five USTs (see Table 2-1) have been identified within this Area, ranging in size from 2,000 gallons to 3,380 gallons. The contents of the USTs were waste JP-4. No operating USTs remain within this Area; all have been excavated.

Additionally, a petroleum pipeline (carrying jet fuels JP-5 and JP-8) traverses this Area to the south of Building 45 (Figure 2-1), and is connected to a tank farm located to the north (outside of Area 1). The pipeline is anticipated to be emptied and abandoned in place.

Hence, within this Area, we anticipate constituents of concern to be primarily petroleum hydrocarbons, and possibly chlorinated solvents localized near the SWMU 23 and SWMU 26 areas.

2.2.2 Soil Stratigraphy within Area

There are 21 soil borings (in addition to borings for monitoring wells discussed in Section 2.2.3) within this Area, see Table 2-2 for further details of these borings. Based on information from soil boring logs, the soil stratigraphy within this Area is silty clay from approximately 0.5 foot bgs to 20 feet bgs, below which is clay. For additional details, refer to the ***Draft RCRA Facility Investigation (RFI) Report for McDonnell Douglas, Hazelwood, Missouri***, dated October 22, 2003 by MACTEC Engineering and Consulting, Inc. (MACTEC, 2003). Bedrock is found in this Area at approximately 80 feet bgs (which consists of low permeability shale). No karst features have been identified in this Area (MACTEC, 2003).

2.2.3 Hydrogeology within Area

There are 19 monitoring wells located within this Area, each with 10 feet of screen in the upper 20 feet bgs, see Table 2-3(R) for further details of these wells. Note that monitoring well details for a few wells are not available. Based on recent (since 2000) groundwater gauging data, groundwater flow within the shallow zone is to the southeast (see Figure 2-2), towards the airport runway. The depth to shallow groundwater within this Area is between 3.5 and 9 feet bgs. No deep monitoring wells are located within this Area.

2.3 LAND USE

2.3.1 Current Land Use

The Area is owned by the St. Louis Airport Authority and is currently leased by Boeing. It is being used as an industrial facility. However, Boeing intends to vacate this Area in 2004, at which point the Area will become a runway protection zone for the St. Louis Airport expansion.

2.3.2 Future Land Use

This Area is anticipated to be part of the runway protection zone; and therefore, cannot have buildings erected according to FAA regulations (personal communication, St. Louis Airport).

2.4 AVAILABLE DATA

The following provides an overview of the available data within the Area:

- Nineteen monitoring wells are located within this Area, of which two are inactive.
- Recent groundwater sampling (since 2001) has been completed at eight wells (MW-A1, MW-A3, MW-A15, MW-A17, MW-A18, MW-A22, MW-A23, and MW-A27).
- Historic (pre-2002) groundwater monitoring was performed from 1990 to 2001 for 18 wells.
- Seventeen soil borings completed as piezometers exist in this Area and have been sampled for groundwater once since 2000.
- A total of 21 soil borings and two pits have been sampled within this Area since 1992 resulting in 28 individual soil samples.

2.5 CONSTITUENTS IDENTIFIED WITHIN AREA

2.5.1 Soil

From 1992 to date, 28 soil samples have been collected within Area 1 during various investigations. Twenty of the soil samples were collected as part of the RFI (MACTEC, 2003).

Data from eight pre-1998 soil samples were also used. These pre-1998 soil samples had some of the highest concentrations of constituents; therefore, by using these older samples in the risk assessment, the results can be considered very conservative since concentrations in these samples would have reduced by natural attenuation since the sources have been removed.

Four of these samples (PIT#3-M, PIT#3-E, PIT#3-D, and PIT#4-D) were collected on August 1, 1992 from Fuel Pits #3 and #4, and the data can be found in the MDNR UST Closure Reports (Part A) for the closure of these two pits. These samples were collected from the excavation limits of these two pits after the USTs had been excavated. The samples' nomenclature indicates where the samples were obtained within the pits (i.e., from the east (E), middle (M), and downgradient (D) ends of the excavations). These samples were obtained from native soils at the bottom of the excavations after the USTs had been excavated at a depth of 15 to 16 feet below the ground surface. These depths were just below the bottom of the tanks, as these USTs were oriented vertically in the subsurface.

Four of the samples (40-10012, 40-11224, 40-20012, and 40-21224) were collected on November 1, 1994 as part of the RFA (SAIC, 1995). These samples were collected from SWMU 26 at depths of 0-1 foot and 1-2 feet along a crack (40-1 samples) and a seam (40-2 samples) next to Building 40.

The soil samples have been analyzed for a comprehensive list of constituents that included VOCs, SVOCs, PCBs, TPH, and metals. Typical laboratory methods that were used include Test Methods for Evaluating Solid Waste (SW-846) methods 3546/DRO, 6010, 7060, 7421, 7471, 7740, 8020, 8021, 8240, 9073, OA1, and OA2. Table B-1 in Appendix B includes a comprehensive table of the laboratory data for soil. For the constituents that were not detected in any soil sample, Table B-2 lists the range of detection limits. PCBs and SVOCs including PAHs were analyzed in pre-1998 samples from this Area, but all were found to be non-detect. These data are not included in Tables B-1 and B-2. Evaluation of the data in Table B-1 indicated that the following 26 constituents were detected in at least one soil sample:

METALs		VOCs/TPH
Aluminum	Lead	Acetone
Antimony	Magnesium	Benzene
Arsenic	Manganese	Ethylbenzene
Barium	Mercury	Toluene
Beryllium	Nickel	TPH (2 types)
Chromium	Potassium	Xylenes
Cobalt	Selenium	
Copper	Sodium	
Iron	Vanadium	
Calcium	Zinc	

The laboratory analysis data for the above listed constituents, i.e., constituents that were detected in at least one sample, are presented in Table 2-4(R).

The maximum and average concentrations of metals were compared with the background levels (Table 2-5(a)). In calculating the average and maximum concentrations for non-detectable constituents, the detection limits were replaced by ½ the detection limit. For this reason, Table 2-5(b) shows the Maximum Detected Concentration, as well as the Maximum Concentration, which may be ½ of the highest detection limit. Metals whose maximum concentrations did not exceed the background levels were eliminated from further consideration. Specifically for Area 1, the following metals were eliminated: aluminum, barium, chromium, potassium, sodium, vanadium, and zinc. Based on this elimination, the following are the remaining chemicals:

METALs		VOCs/TPH
Antimony	Lead	Acetone
Arsenic	Magnesium	Benzene
Beryllium	Manganese	Ethylbenzene
Cobalt	Mercury	Toluene
Copper	Nickel	TPH (2 types)
Iron	Selenium	Xylenes
Calcium		

Of the above constituents iron, calcium, and magnesium were eliminated, as they are ubiquitous in nature and not related to any known anthropogenic sources in this Area. Also, toxicity data for calcium and magnesium are not available. The concentration of lead ranged from 7,400 ug/kg to 34,100 ug/kg in the 11 samples analyzed for lead. Lead exceeded the background level of 21,800 ug/kg in four samples. However, since all of the detected concentrations are significantly less than the screening level of 750,000 ug/kg discussed in Section 1.9.10, lead was also eliminated. Lead is also discussed in the RFI (MACTEC, 2003).

Impact by petroleum organics was generally observed in vicinity of the fuel pits at SWMU 14 (which previously stored waste jet fuel in two underground storage tanks), and along an underground petroleum pipeline on the south side of Building 45, see Figure 2-1. Since these petroleum impacts were related to jet fuels (JP-4, JP-5, and JP-8); lead was not considered a chemical of concern since the jet fuels are not leaded fuels. The RFI provides more information and specifications on the makeup of the jet fuels (MACTEC, 2003). Petroleum impact was not observed at SWMU 26.

2.5.2 Groundwater

During the various investigations conducted within this Area, groundwater samples were analyzed for a comprehensive list of constituents that included VOCs, TPH, and metals using SW 846 laboratory analysis methods 3510/DRO, 6010, 7470, 8015, 8021, 8260, OA1, and OA2. Table B-3 of Appendix B includes a comprehensive list of the groundwater analytical data. For the constituents that were not detected in any groundwater sample, Table B-4 lists the range of detection limits.

Of the various constituents analyzed in groundwater, the following 21 constituents were detected in at least one groundwater sample:

METALs	VOCs/TPH	
Arsenic	1,2,3-Trimethylbenzene	Acetone
Barium	1,2,4-Trimethylbenzene	Benzene
Chromium	Ethylbenzene	Xylenes
Lead	Isopropyl benzene	Toluene
	Naphthalene	TPH (3 types)
	n-Butylbenzene	MTBE
	n-Propylbenzene	sec-Butylbenzene
	p-Isopropyltoluene	tert-Butylbenzene
		Trichloroethene

Data for the above listed constituents is presented in Table 2-6. Note that SVOCs and PCBs were not analyzed in groundwater samples since these constituents had not been detected in soil samples collected from this Area, and are not listed on Table 2-6.

The maximum and average groundwater concentrations for each detected constituent were compared with various target level criteria. Constituents for which the target level criteria exceeded the maximum detected concentration were eliminated for further consideration. As shown in Table 2-7(a), these included ethylbenzene, isopropylbenzene, methyl tertiary butyl ether (MTBE), naphthalene, n-butylbenzene, p-isopropyltoluene, sec-butylbenzene, toluene, tert-butylbenzene, trichloroethene, xylenes, barium, chromium, and lead. The remaining constituents consist of the following five VOCs, TPHs, and one metal:

METALs	VOCs/TPH	
Arsenic	1,2,3-Trimethylbenzene	Acetone
	1,2,4-Trimethylbenzene	Benzene
	n-Propylbenzene	TPH (3 types)

As shown on Table 2-7(b), the above includes detected constituents that exceeded the target level criteria, detected constituents that did not have target level criteria for comparison, and all types of TPH that were analyzed whether detected or not.

In calculating the average and maximum concentrations for non-detectable constituents, the detection limits were replaced by ½ of the detection limit for each specific constituent. For certain constituents, ½ the maximum detection limit exceeded the highest detected concentration. For this reason, Table 2-7(b) shows the Maximum Detected Concentration, as well as the Maximum Concentration, which may be ½ of the highest detection limit.

Within this Area, 25 groundwater-sampling points exist, which have been sampled recently. Additionally, there are a number of historic groundwater monitoring wells, which have not been sampled recently (see Table 2-8(R) for historic data). To demonstrate the overall concentration trend, concentration vs. time plots have been developed for six of these monitoring wells [see

Figures 2-3(a) through (f)] for which historic data is available. This evaluation of the overall concentration trend indicates that concentrations are decreasing.

The most recent data (2001 - 2003) ~~is~~ are being used quantitatively in this risk evaluation, as it is most representative of current conditions; however, the historic data provides valuable information regarding the overall groundwater concentration trends.

As discussed in Section 2.6, free product was observed recently in March 2004 at well MW-A1 with a sheen in B45CMW-3A and MW-A3, all located near the Hush Houses (Buildings 45C & 45D). B45CMW-3B had a sheen during all sampling events in 1998.

2.6 FREE PRODUCT

Free product has historically been observed within this Area near Buildings 45C, 45D, and 45E (Hush Houses/SWMU 12, 13, 23) where USTs for jet fuel and hydraulic fluid and 55-gallon drums were formerly located. Historically, observed thicknesses of free product range from a sheen to 6.5 feet. Free product removal activities have been performed in this Area since 1989. Table 2-3(R) provides screened intervals and free product data. Table 2-3(a) provides detailed free product thicknesses. Table 2-8(R) presents the historical groundwater data for BTEX. This data was used to prepare Figures 2-3(a)(R) to 2-3(f)(R), which show the dissolved BTEX concentration trend over time in six of the monitoring wells. Based on the data, there are four monitoring wells in Area 1, which have had free product present since 1992 (MW-A1, MW-A3, B45CMW-3A, and B45CMW-3B). All appear to be stable or decreasing. MW-A1 is the only monitoring well with measurable free product (0.02 to 0.04 foot) during the last six measurements from November 2003 to March 2004. The other three monitoring wells have had sheens during their last monitoring events:

- MW-A3 had sheen or none during last 14 measurements from February 2002 to March 2004
- B45CMW-3A had sheen or none during last 13 measurements from June 2003 to March 2004
- B45CMW-3B had sheen during last 21 measurements from January 1998 to November 1998

The screened interval for MW-A1 and MW-A3 is 5-15 feet bgs. All measured groundwater depths in MW-A1 from April 2001 to March 2004 were below the top of screen (27 events). All measured groundwater depths in MW-A3 from April 2003 to March 2004 were below the top of screen (8 events). The screened intervals for B45CMW-3A and B45CMW-3B are unknown.

This indicates that in recent years, free product thicknesses have been stable at low levels. Further, since dissolved concentrations of benzene, toluene, ethylbenzene, and total xylenes (BTEX) Figure 2-3(a)(R) to (f)(R) show a clear decreasing trend, the residual free product is not an ongoing source of constituents.

2.7 EXPOSURE MODEL

2.7.1 Current conditions

Under current conditions, Boeing has commercial workers within this Area; however, in the very near future, Boeing will shut down their operations, at which point there will be no workers on-site. Hence, the risk and exposure to these workers will not be quantified. The only receptor

under current conditions would be the visitor or maintenance worker to the Area. As the exposure duration for the visitor or maintenance worker is (i) small and (ii) site conditions will change in the very near future (few months); the risk from any soil or groundwater impact will not be quantitatively evaluated for the visitor or maintenance worker.

2.7.2 Future conditions

Under future conditions, this Area is anticipated to be used as the Runway Protection Zone (personal communication, St. Louis Airport) – an area where no building construction of any form can take place, as per FAA regulations. The Area will continue to be paved. There will be no receptor present in the Area other than a maintenance worker/visitor to the Area or construction worker. As the exposure duration for the maintenance worker/visitor is small and less than that for the construction worker, the risk from any soil or groundwater impact will not be quantitatively evaluated for the maintenance worker/visitor.

In the future, construction work could be performed within this Area; therefore, the potential future construction worker is a receptor. Exhibit 2-1 presents the Exposure Model (EM) for the construction worker.

EXHIBIT 2-1. EM FOR POTENTIAL FUTURE CONSTRUCTION WORKER

Scenario, Receptor, and Pathways/Routes Analyzed	C or NC	Justification
Dermal Contact with Soil	C	**Soil is impacted at depths less than 10 feet, which is considered the construction zone; therefore, contact is possible.**
Accidental Ingestion of Soil	C	**Soil is impacted at depths less than 10 feet, which is considered the construction zone; therefore, contact is possible.**
Outdoor Inhalation of Vapors and Particulates from Soil	C	**Soil is impacted within this Area, and a number of the constituents identified are volatile; therefore, this pathway is complete.**
Dermal Contact with Groundwater	C	**Depth to groundwater ranges from 3.5 to 9 ft bgs, which is within the typical zone of construction. Hence this pathway is possible.**
Outdoor Inhalation of Vapors from Groundwater	C	**Groundwater within this Area is impacted by volatile constituents; hence, this pathway is complete.**

Notes: **NC:** Not Complete **C:** Complete

Exposure pathways highlighted in bold indicate that these pathways are complete and will be quantitatively evaluated.

Additional receptors include occasional visitors and maintenance workers whose exposure frequency and exposure duration are expected to be less than that for construction worker; hence the risk to these receptors will not be quantified.

Note, in this Area any construction is anticipated to be regulated by FAA and construction workers would likely be Occupational Safety and Health Administration (OSHA) trained, thus providing another level of protection to the workers.

2.8 REPRESENTATIVE CONCENTRATIONS FOR CONSTRUCTION WORKER

Only one receptor, the potential future construction worker, exists within this Area. The representative concentration was determined to be the area wide average, as a construction worker could work in any portion of the Area, and there is not one specific source area present, but rather a number of smaller source areas. Tables 2-5(b) and 2-7(b) present the soil and groundwater average and maximum concentrations. For Area 1, carcinogen and non-carcinogen risks have been calculated using the maximum, as well as the average concentrations. The results are discussed below.

2.9 CALCULATION OF RISK

Table 2-9(R) presents the results for a future construction worker using the average soil and groundwater concentrations. The table presents the carcinogenic (Individual Excess Lifetime Cancer Risk, (IELCR)) and non-carcinogenic (Hazard Quotient (HQ) and Hazard Index (HI)) risks for:

- Each COC,
- Each route of exposure,
- Cumulative risk for each COC,
- Cumulative risk for each route of exposure, and
- Total risk, which is the sum of risk for all the COCs and all the routes of exposures.

The risks were also calculated using the maximum soil and groundwater concentrations, which are shown on Table 2-10(R). The following are the key observations.

Carcinogenic Risk:

As indicated in Table 2-10(R), the cumulative IELCR (calculated using the maximum soil and groundwater concentrations) is 6.34×10^{-7} that is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and each route of exposure would be less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 2-10(R), the cumulative HI is 0.5 (calculated using the maximum soil and groundwater concentrations) that is well below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

2.10 CONSIDERATION OF FREE PRODUCT

According to the MRBCA guidance document, the detection of LNAPL, also known as free product, at the site must trigger a response sufficient to achieve the following objectives. Each of which is discussed below:

1. LNAPL should not be present at levels that would cause explosive conditions to occur at or near the site. The source has been removed and the free product has had time to weather. There has not been construction in the Hush House area at which PID readings could have been taken; however, Boeing took lower explosive limit (LEL) readings on April 14, 2004 directly from three of the monitoring wells immediately after removing the top caps, from three storm sewer manway access locations, and from a subsurface oil/water separator vault that are located in the Hush House area. See Figure 2-4 for locations of LEL readings. The results of the LEL readings are shown in the table below, including the distances from the LEL measurement location to monitoring well MW-A1.

Location	LEL Reading	Distance from MW-A1 (feet)
MW A3	0%	36.5
MW A1	>10 %	0
B45CMW-3A	0%	79
Storm sewer near MW 3A	2%	79
Storm sewer near MW A3	2%	~40
Storm sewer near MW A 17	0%	~40
Oil/water separator vault	2%	24.5

Monitoring well MW-A1 had an LEL reading that exceeded 10%. This is the monitoring well with recent free product measurements of 0.02 to 0.04 foot during the last six measurements from November 2003 to March 2004. This reading is not unexpected since the measurement was taken immediately after removal of the monitoring well top cap, and is certainly not representative of accumulation in confined spaces where a human activity may occur. All LEL readings in confined spaces (storm sewer and subsurface vault) were 2% LEL or zero. These are the areas in which human activities could occur, and the readings show these areas did not contain explosive atmospheres.

2. The LNAPL plume shall be fully delineated. There is one monitoring well, MW-A1, which has had measurable free product (0.02 to 0.04 foot) during the last six measurements from November 2003 to March 2004. The latest sampling event (7/2/03) detected total TPH of 20,900 ug/L and total BTEX of 3.1 ug/L with benzene and toluene non-detectable. The LNAPL plume has been delineated as shown by the following sampling locations. The data for which is presented on Tables 2-3(R), 2-3(a), 2-6, and 2-8(R). The sample locations are shown on Figure 2-1.

   - MW-A18 (25 feet southeast of MW-A1) – Shallow Monitoring Well – No free product since 1992;
   - MW-A17 (35 feet east of MW-A1) – Shallow Monitoring Well – No free product historically;
   - MW-A21 (15 feet west of MW-A1) – Shallow Monitoring Well – Sheen historically;
   - MW-A3 (35 feet northwest of MW-A1) – Shallow Monitoring Well – had sheen or none during last 14 measurements from February 2002 to March 2004 MW-A3 had sheen or none during last 14 measurements from February 2002 to March

2004;

- MW-A2 (30 feet northwest of MW-A1) – Shallow Monitoring Well – Sheen historically;

- B45CMW-3A (70 feet northwest of MW-A1) – Shallow Monitoring Well – had sheen or none during last 13 measurements from June 2003 to March 2004;

- B45CMW-3B (85 feet northwest of MW-A1) – Shallow Monitoring Well – had sheen during last 21 measurements from January 1998 to November 1998;

- B45CS1D (50 feet southwest of MW-A1) – Deep Piezometer – No free product historically;

- B45CS2 (120 feet south east of MW-A1) – Shallow Piezometer – No free product historically; and

- B45CS3D (125 feet northeast of MW-A1) – Deep Piezometer – No free product historically.

3. Dissolution of and volatilization from LNAPL should not generate dissolved phase or vapor phase concentrations that result in unacceptable human or ecological risk. Regarding dissolved phase, Figures 2-3(a)(R) and 2-3(b)(R) shows a definite decreasing concentration trend for BTEX from 1990 to 2003 for monitoring wells MW-A1 and MW-A2. Lab data in Table 2-6 also indicates low dissolved concentration levels in other monitoring wells near MW-A1 as summarized below:

   - MW-A18 – Last sampling event (7/29/03) was non-detectable for BTEX with a low level detect for:
     - TPH-C10-C40 (210 ug/L J-value vs. 10,000 ug/L ITL);

   - MW-A17 – Last sampling event (6/26/03) had low level detects for:
     - Acetone (60 ug/L vs. 121 ug/L MCL-equivalent);
     - TPH-C10-C40 (160 ug/L vs. 10,000 ug/L ITL);

   - MW-A21 – Last sampling event (6/5/1990) detected:
     - Benzene (17 ug/L vs. 5 ug/L MCL);
     - Xylenes, total (32 ug/L vs. 10,000 ug/L MCL);

   - MW-A3 – Last sampling event (6/26/03) had low level detects of:
     - Isopropylbenzene (5.5 ug/L vs. 4,000 ug/L EPA Health Advisory);
     - MTBE (5.1 ug/L vs. 146 ug/L calculated target level);
     - n-Propylbenzene (7.8 ug/L vs. 5.27 ug/L calculated target level);
     - p-Isopropyltoluene (5.4 ug/L vs. 107 ug/L calculated target level);
     - sec-Butylbenzene (5.1 ug/L vs. 48.6 ug/L calculated target level);
     - tert-Bbutylbenzene (2.3 ug/L vs. 48.6 ug/L calculated target level);
     - TPH, Misc C10-C40 (9,500 ug/L vs. 10,000 ug/L ITL);
     - TPH, GC/FID low fraction (3,800 ug/L vs. 10,000 ug/L ITL);

   - MW-A2 – Last sampling event (7/6/93) had low level detect of:

- Xylenes, total (2 ug/L vs. 10,000 ug/L MCL);

- B45CMW-3A – Last sampling event (7/2/03) had low level detects of:
  - sec-Butylbenzene (1.1 ug/L vs. 48.6 ug/L calculated target level)
  - 1,2,3-Trimethylbenzene (3.4 ug/L – no established groundwater screening level);
  - 1,2,4-Trimethylbenzene (1.7 ug/L vs. 70 ug/L MCL);
  - TPH, GC/FID low fraction (220 ug/L vs. 10,000 ug/L ITL);
  - TPH, Misc C10-C40 (9,500 ug/L vs. 10,000 ug/L ITL);

- B45CMW-3B – Last sampling event (6/26/03) had low level detects of:
  - Naphthalene (5.3 ug/L vs. 100 ug/L EPA Health Advisory);
  - TPH, GC/FID low fraction (160 ug/L vs. 10,000 ug/L ITL);
  - TPH, Misc C10-C40 (1,400 ug/L vs. 10,000 ug/L ITL);

- B45CS1D – Last sampling event (11/15/02) was non-detectable for BTEX, MTBE, and TPH;

- B45CS2 – Last sampling event (11/14/02) was non-detectable for BTEX, MTBE, & TPH; and

- B45CS3D – Last sampling event (11/20/02) was non-detectable for BTEX, MTBE, & TPH.

Regarding vapor phase concentrations, inhalation is not an issue in Area 1 since this will be a Runway Protection Zone and no buildings are allowed.

4. Both the LNAPL and its associated dissolved phase plume shall be stable or shrinking. Table 2-3(a) shows a stable or decreasing LNAPL thickness trend for the four monitoring wells (MW-A1, MW-A3, B45CMW-3A, and B45CMW-3B) that have detected measurable LNAPL in Area 1 since 1992. Figures 2-3(a)(R) and 2-3(b)(R) shows a definite decreasing concentration trend for BTEX from 1990 to 2003 for monitoring wells MW-A1 and MW-A2.

5. LNAPL shall be removed to the maximum extent practicable. Boeing has been removing LNAPL from this area since 1989, and has gotten the LNAPL out of the ground to the maximum extent practicable.

The data collected from Area 1 shows that the MRBCA goals regarding free product have been achieved.

2.11 ECOLOGICAL RISK

The only potential ecological receptor in the area is Coldwater Creek, which flows north about 2,700 feet to the northeast of Area 1. There are no known unpermitted conduits present that could carry impacts from Area 1 to Coldwater Creek. Considering the geology, groundwater flow characteristics and the chemical types and concentrations of impacts in Area 1, it is not likely that migration of impacts from Area 1 to Coldwater Creek will occur. The Tier 1 ecological screening checklists have been completed for this Area, and are presented as

Attachment 2-A(R), and Attachment 2-B(R). These checklists identified no potential ecological receptors or issues.

2.12 CONCLUSIONS

The calculated risk for all the COCs and all potentially complete routes of exposure for the construction worker is below the regulatory acceptable target levels.

TABLE 2-1
SUMMARY OF UNDERGROUND STORAGE TANKS (USTs) HISTORICALLY PRESENT WITHIN AREA 1: RUNWAY PROTECTION ZONE
BOEING TRACT 1, ST. LOUIS, MISSOURI

UST No.	Location	Volume (Gallons)	Contents	Construction Material	Year Installed	Status	Comments
B26	Ramp D	3380	Waste JP-4	Single Wall Steel	1963	Removed 1983	Excavated
B27	Ramp D	3380	Waste JP-4	Fiberglass	1983	Removed 1989	Excavated
B28	Ramp A	2130	Waste JP-4	Fiberglass	1978	Removed 1990	Excavated
B29	Ramp B (Fuel Pit #3)	2000	Waste JP-4	Single Wall Steel	1977	Removed 1992	Excavated
B30	Ramp B (Fuel Pit #4)	2000	Waste JP-4	Single Wall Steel	1983	Removed 1992	Excavated

Note:
UST B27 replaced UST B26

TABLE 2-2
SOIL BORING INFORMATION FOR AREA 1: RUNWAY PROTECTION ZONE
BOEING TRACT 1, ST. LOUIS, MISSOURI

Area	Boring	Date Drilled
SWMU 26	40-1	11/1/1994
	40-2	11/1/1994
	S26B1	6/1/1998
	S26B2	6/1/1998
	S26B3	6/1/1998
Building 40	B40E1	11/2/2002
	B40E2	11/2/2002
	B40S1	11/2/2002
	B40S2	11/2/2002
	B40W1	11/2/2002
Buildings 45 & C, D, E	A1-1*	NA
	A2-2*	NA
	B45S1D*	11/2/2002
	B45S2	11/2/2002
	B45S3	11/2/2002
	B45S4	11/2/2002
	B45S5D	11/2/2002
	B45S6	11/2/2002
	B45S7	11/2/2002
	B45CS2	11/14/2002
	B45CS3D	11/20/2002

Notes:
NA: no information available
* No analytical data available
Total number of Borings = 21
Borings with available data = 18
Soil samples were also obtained from Pit #3 (3 samples) and Pit #4 (1 sample)

TABLE 2-3(R)
MONITORING WELL INFORMATION FOR AREA 1: RUNWAY PROTECTION ZONE
BOEING TRACT 1, ST. LOUIS, MISSOURI

Location	Monitoring Well	Diameter (inches)	Screened Interval (ft bgs)	Total Depth (ft)	Installation Date	Status	# of Times Sampled	Last Time Sampled	Free Product at Installation	Free Product Observed Since 1992
South of Bldg. 45	MW-A22	2	4.5-14.5	15	10/30/1989	Active	2	3/20/2003	yes	no
	MW-A27	2	3.7-13.7	15	11/1/1989	Active	2	7/29/2003	no	no
	MW-A28	2	4.5-14.5	15	11/1/1989	Active			yes	no
	MW-A29	2	4.5-14.5	15	11/1/1989	Active			no	no
	MW-A5	2	2-12.5	15	7/18/1989	Active			yes	no
	MW-A15	2	4.5-14.5	15	8/3/1989	Active	1	7/2/2003	yes	no
	MW-A14	2	4.5-14.5	15	8/3/1989	Active			yes	NA
	MW-A23	2	2.7-12.7	15	10/30/1989	Active	2	7/29/2003	yes	no
	MW-A24	2	3-13	15	10/31/1989	Active			no	no
	MW-A26	2	4-14	15	11/1/1989	Active			no	no
	MW-A25	2	3-13	15	11/1/1989	Active			NA	NA
Hush House	MW-A1	2	5-15	15	7/12/1989	Active	3	7/2/2003	yes	yes
	MW-A2	2	4-14.5	17	7/12/1989	Inactive			sheen	NA
	MW-A3	2	5-15	15	7/13/1989	Active	1	6/26/2003	yes	yes
	MW-A17	2	4.5-14.5	15	8/4/1989	Active	1	6/26/2003	no	no
	MW-A21	2	1.5-11.5	15	8/8/1989	Inactive			sheen	NA
	B45CMW-3A	4	NA	14.4*	1995	Active			yes	yes
	B45CMW-3B	4	NA	14.5*	1995	Active			yes	yes
	MW-A18	2	4.5-14.5	15	8/4/1989	Active	2	7/29/2003	sheen	no

Notes:
no: No free product observed historically
yes: Free product observed historically
sheen: Sheen observed historically
NA: No information available
ft bgs: Feet below ground surface
ft: Feet
* Assumed total depth is equal to known depth to bottom of screened interval
The thickness of free product is tabulated in Table 2-3(a)

TABLE 2-3(a)
HISTORIC FREE PRODUCT THICKNESSES FOR AREA 1: RUNWAY PROTECTION ZONE
BOEING TRACT 1, ST. LOUIS, MISSOURI

B45CMW-3A				B45CMW-3B			
Date	Product Thickness (ft)	Depth to GW (ft)	Screened Interval (ft)	Date	Product Thickness (ft)	Depth to GW (ft)	Screened Interval (ft)
1/14/1998	Sheen	5.79	Unk	1/14/1998	Sheen	4.35	Unk
1/28/1998	Sheen	6.18	Unk	1/28/1998	Sheen	4.92	Unk
2/13/1998	Sheen	5.83	Unk	2/13/1998	Sheen	4.98	Unk
2/27/1998	Sheen	5.80	Unk	2/27/1998	Sheen	4.70	Unk
3/13/1998	0.01	5.01	Unk	3/13/1998	Sheen	5.00	Unk
3/25/1998	Sheen	5.68	Unk	3/25/1998	Sheen	4.67	Unk
4/9/1998	0.03	5.80	Unk	4/9/1998	Sheen	5.00	Unk
4/22/1998	Sheen	5.84	Unk	4/22/1998	Sheen	5.12	Unk
5/7/1998	Sheen	5.77	Unk	5/7/1998	Sheen	4.86	Unk
5/21/1998	Sheen	5.76	Unk	5/21/1998	Sheen	5.00	Unk
6/5/1998	Sheen	5.82	Unk	6/5/1998	Sheen	4.87	Unk
6/24/1998	Sheen	5.77	Unk	6/24/1998	Sheen	4.95	Unk
7/13/1998	Sheen	5.83	Unk	7/13/1998	Sheen	5.05	Unk
7/22/1998	Sheen	6.10	Unk	7/22/1998	Sheen	5.19	Unk
8/26/1998	Sheen	6.09	Unk	8/26/1998	Sheen	5.34	Unk
9/14/1998	0.08	6.22	Unk	9/14/1998	Sheen	5.37	Unk
9/28/1998	0.05	6.14	Unk	9/28/1998	Sheen	5.29	Unk
10/12/1998	0.08	6.18	Unk	10/12/1998	Sheen	5.31	Unk
10/22/1998	Sheen	6.01	Unk	10/22/1998	Sheen	5.23	Unk
11/5/1998	Sheen	5.78	Unk	11/5/1998	Sheen	5.10	Unk
11/18/1998	Sheen	6.12	Unk	11/18/1998	Sheen	5.34	Unk
2/26/1999	0.06		Unk				
3/8/1999	0.59		Unk				
3/24/1999	0.13		Unk				
4/12/1999	0.13		Unk				
4/27/1999	0.07		Unk				
5/6/1999	0.05		Unk				
5/20/1999	0.08		Unk				
6/11/1999	0.04		Unk				
7/14/1999	0.03		Unk				
7/29/1999	0.01		Unk				
8/6/1999	0.01		Unk				
8/20/1999	0.01		Unk				
2/26/2001	0.02	7.50	Unk				
3/22/2001	0.00	6.67	Unk				
4/30/2001	0.02	6.19	Unk				
5/25/2001	0.02	6.23	Unk				
6/19/2001	0.02	5.58	Unk				
7/19/2001	0.00	5.67	Unk				
8/23/2001	0.04	6.25	Unk				
9/17/2001	0.02	6.31	Unk				
10/23/2001	0.04	5.75	Unk				
11/13/2001	0.02	6.25	Unk				
12/4/2001	0.02	5.75	Unk				
1/16/2002	0.02	6.42	Unk				
2/14/2002	0.00	6.19	Unk				
4/9/2003	0.25	6.02	Unk				
4/23/2003		6.08	Unk				
5/12/2003	Sheen		Unk				
5/23/2003	Sheen		Unk				
5./30/2003	Sheen	6.38	Unk				
6/23/2003	0.02		Unk				
6/23/2003	Sheen		Unk				
7/18/2003	Sheen	5.63	Unk				
8/26/2003	Sheen	5.54	Unk				
9/2003	Sheen		Unk				
9/10/2003	Sheen	5.40	Unk				
10/3/2003	Sheen		Unk				
10/10/2003	Sheen	5.69	Unk				
10/22/2003	Sheen	5.50	Unk				
12/11/2003	Sheen	5.63	Unk				
1/21/2004	Sheen	5.77	Unk				
2/17/2004	0.00	6.00	Unk				
2/17/2004	Sheen	6.00	Unk				
3/12/2004	Sheen	5.67	Unk				

TABLE 2-3(a)
HISTORIC FREE PRODUCT THICKNESSES FOR AREA 1: RUNWAY PROTECTION ZONE
BOEING TRACT 1, ST. LOUIS, MISSOURI

MW-A1				MW-A3			
Date	Product Thickness (ft)	Depth to GW (ft)	Screened Interval (ft)	Date	Product Thickness (ft)	Depth to GW (ft)	Screened Interval (ft)
1/14/1998	Sheen	6.80	5-15	1/14/1998	0.10	5.55	5-15
1/28/1998	Sheen	7.05	5-15	1/28/1998	0.15	5.70	5-15
2/13/1998	Sheen	6.14	5-15	2/13/1998	0.06	4.75	5-15
2/27/1998	Sheen	6.22	5-15	2/27/1998	Sheen	4.38	5-15
3/13/1998	Sheen	6.02	5-15	3/13/1998	Sheen	4.32	5-15
3/25/1998	0.03	5.46	5-15	3/25/1998	Sheen	3.80	5-15
4/9/1998	Sheen	5.44	5-15	4/9/1998	Sheen	3.84	5-15
4/22/1998	Sheen	5.65	5-15	4/22/1998	Sheen	6.95	5-15
5/7/1998	0.02	5.62	5-15	5/7/1998	Sheen	3.84	5-15
5/21/1998	0.01	5.56	5-15	5/21/1998	Sheen	3.89	5-15
6/5/1998	0.01	5.69	5-15	6/5/1998	Sheen	4.25	5-15
6/24/1998	0.04	5.75	5-15	6/24/1998	Sheen	4.63	5-15
7/13/1998	0.05	6.06	5-15	7/13/1998	Sheen	4.73	5-15
7/22/1998	0.09	6.42	5-15	7/22/1998	0.01	5.75	5-15
8/26/1998	0.09	6.45	5-15	8/26/1998	Sheen	4.91	5-15
9/14/1998	0.05	6.49	5-15	9/14/1998	Sheen	4.69	5-15
9/28/1998	0.12	6.67	5-15	9/28/1998	Sheen	5.09	5-15
10/12/1998	0.09	6.85	5-15	10/12/1998	0.06	5.55	5-15
10/22/1998	0.05	6.80	5-15	10/22/1998	0.08	5.46	5-15
11/5/1998	Sheen	6.30	5-15	11/5/1998	Sheen	4.46	5-15
11/18/1998	Sheen	6.29	5-15	11/18/1998	Sheen	4.11	5-15
9/24/1999	0.02		5-15	4/27/1999	0.03		5-15
10/15/1999	0.06		5-15	5/20/1999	0.02		5-15
11/12/1999	0.05		5-15	10/15/1999	0.06		5-15
1/21/2000	0.12		5-15	11/12/1999	0.01		5-15
2/28/2000	0.06		5-15	1/21/2000	0.07		5-15
3/31/2000	0.07		5-15	3/31/2000	0.01		5-15
2/26/2001	0.04	7.04	5-15	2/26/2001	0.02	6.60	5-15
3/22/2001	0.04	4.58	5-15	3/22/2001	0.00	4.42	5-15
4/30/2001	0.04	6.46	5-15	4/30/2001	0.00	5.08	5-15
5/25/2001	0.06	5.06	5-15	5/25/2001	0.02	4.60	5-15
6/19/2001	0.04	6.21	5-15	6/19/2001	0.02	5.35	5-15
7/19/2001	0.04	5.25	5-15	7/19/2001	0.04	6.40	5-15
8/23/2001	0.06	6.06	5-15	8/23/2001	0.06	5.21	5-15
9/17/2001	0.04	6.08	5-15	9/17/2001	0.02	5.27	5-15
10/23/2001	0.04	5.67	5-15	10/23/2001	0.04	4.38	5-15
11/13/2001	0.04	5.06	5-15	11/13/2001	0.04	4.75	5-15
12/4/2001	0.04	5.38	5-15	12/4/2001	0.04	4.33	5-15
1/16/2002	0.04	5.02	5-15	1/16/2002	0.02	4.79	5-15
2/14/2002	0.02	5.33	5-15	2/14/2002	0.00	4.58	5-15
4/9/2003	1.00	5.25	5-15	4/9/2003	0.00	5.60	5-15
4/28/2000	0.08		5-15				
4/23/2003	0.33	5.38	5-15				
5/12/2003	0.25		5-15				
5/23/2003	0.33		5-15	5/23/2003	Sheen		5-15
5/30/2003	0.17	6.42	5-15				
6/23/2003	0.08		5-15	6/2003	Sheen		5-15
6/23/2003	0.10		5-15				
7/18/2203	0.02	5.50	5-15				
8/26/2003	Sheen	5.25	5-15				
9/1/2003	Sheen		5-15	9/2003	Sheen		5-15
9/10/2003	Sheen	5.10	5-15				
10/3/2003	Sheen		5-15	10/3/2003	0.00		5-15
10/10/2003	0.01	5.33	5-15				
10/22/2003	Sheen	5.58	5-15				
11/3/2003	Sheen	5.50	5-15				
11/3/2003	Sheen	5.04	5-15	11/3/2003	Sheen	5.25	5-15
11/17/2003	0.02	5.33	5-15	11/17/2003	Sheen	5.54	5-15
12/1/2003	0.02		5-15	12/1/2003	Sheen		5-15
12/11/2003	0.02	5.58	5-15	12/11/2003	Sheen	5.83	5-15
1/21/2004	0.02	6.08	5-15	1/21/2004	Sheen	5.83	5-15
2/17/2004	0.02	5.58	5-15	2/17/2004	Sheen	5.56	5-15
2/17/2004	0.04	5.67	5-15	2/17/2004	Sheen	5.42	5-15
3/12/2004	0.04	5.50	5-15	3/12/2004	Sheen	5.54	5-15

Notes:
ft: Feet
Unk: Unknown
Highlighted depths to GW above top of screened interval

TABLE 2-4(R)
SOIL DATA FOR AREA 1: RUNWAY PROTECTION ZONE
BOEING TRACT 1, ST. LOUIS, MISSOURI

Sample ID	Date	Depth (ft bgs)	Acetone	Benzene	Ethylbenzene	Toluene	Xylenes, Total	Diesel #1	Diesel #2	Gasoline (C6-C14)	Kerosene	Motor Oil (C16-C33)	Stoddard Solvent	TPH (GC/FID) High Fraction	TPH (GC/FID) Low Fraction	TPH (ORO)	Arsenic	Barium	Chromium
PIT#3 - M	8/1/92	16		139000	<5000	20000	<15000									117000			
PIT#3-E	8/1/92	16		150000	<5000	75000	<15000									49000			
PIT#3-D	8/1/92	15		128000	<5000	26000	<15000									61000			
PIT#4-D	8/1/92	15		258000	663000	3980000	2970000									13000			
40-10012	11/1/94	0-1	<19	<10	<10	<10	<10									ND	43300	212000	19500
40-11224	11/1/94	1-2	<27	<13	<13	<13	<13									ND	43000	245000	18500
40-20012	11/1/94	0-1	<48	<10	<10	<10	<10									ND	35600	303000	15100
40-21224	11/1/94	1-2	<25	<10	<10	<10	<10									ND	44800	201000	19200
B40E1-6	11/14/02	6		< 1	< 1	< 1		< 5000	< 5000		< 5000	< 5000	< 5000						
B40E2-6	11/14/02	6		< 1	< 1	< 1		< 5000	< 5000		< 5000	< 5000	< 5000						
B40S1-6	11/14/02	6		< 1	< 1	< 1		< 5000	< 5000		< 5000	< 5000	< 5000						
B40S2-6	11/14/02	6		< 1	< 1	< 1		< 5000	< 5000		< 5000	< 5000	< 5000						
B40W1-6	11/14/02	6		< 1	< 1	< 1		< 5000	< 5000		< 5000	< 5000	< 5000						
B45CS2-6	11/14/02	6		< 50	< 50	< 50	< 50	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000						
B45CS3D-6	11/20/02	6		< 2.5	< 2.5	< 25	< 7.5							< 4000	< 500				
B45S2-7	11/18/02	7		601	< 5000	3200	360	< 5000	< 5000	186000	< 5000	< 5000	< 5000						
B45S2-7 DUP	11/18/02	7		549	< 50	2930	263	< 5000	< 5000	163000	< 5000	< 5000	< 5000						
B45S3-7	11/18/02	7		242	< 50	1550	328	< 5000	< 5000	206000	< 5000	< 5000	< 5000						
B45S4-7	11/18/02	7		< 50	< 50	< 50	< 50	< 5000	< 5000	12000	< 5000	< 5000	< 5000						
B45S6-6	11/18/02	6		< 50	< 50	< 50	< 50	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000						
B45S7-7	11/18/02	7		< 50	< 50	67	113	< 5000	< 5000	68000	< 5000	< 5000	< 5000						
S26B1 10-11	2/3/98	10-11	34				< 6.5										< 6400	89000	15000
S26B1 2-3	2/3/98	2-3	39				< 6.4										< 6200	210000	22000
S26B1 7-9	2/3/98	7-9	< 13				< 6.4										7600	120000	18000
S26B2 3-4	2/5/98	3-4	73				< 6.3										8600	170000	20000
S26B2 7-8	2/5/98	7-8	17				< 6.5										< 6400	83000	16000
S26B3 2-3	2/3/98	2-3	24				< 6.4										8100	220000	22000
S26B3 9-11	2/3/98	9-11	17				< 6.4										8700	110000	12000

Notes:
All concentrations in ug/kg (micrograms per kilogram)
< Less than detection limit shown
Blanks: Not analyzed
ND: Not detected
VOC: Volatile organic compound
TPH: Total petroleum hydrocarbon
GC/FID: Gas chromatograph/flame ionization detector
ORO: Oil range organic
ft bags: Feet below ground surface
Lab qualifiers in Section 1.0

TABLE 2-4(R)
SOIL DATA FOR AREA 1: RUNWAY PROTECTION ZONE
BOEING TRACT 1, ST. LOUIS, MISSOURI

Sample ID	Date	Depth (ft bgs)	Lead	Mercury	Selenium	Aluminum	Antimony	Beryllium	Calcium	Cobalt	Copper	Iron	Magnesium	Manganese	Nickel	Potassium	Sodium	Vanadium	Zinc
PIT#3 - M	8/1/92	16																	
PIT#3-E	8/1/92	16																	
PIT#3-D	8/1/92	15																	
PIT#4-D	8/1/92	15																	
40-10012	11/1/94	0-1	34100	26	<3090	17300000	4350	1340	5420000	11000	15500	24700000	2970000	949000	23600	858000	519000	41000	42000
40-11224	11/1/94	1-2	30500	490	<3090	18000000	4210	1370	3370000	10400	16100	23600000	3140000	1280000	28700	742000	497000	40700	46500
40-20012	11/1/94	0-1	27700	243	<3090	17200000	3540	<1200	3970000	11600	12800	23700000	2750000	2580000	21400	657000	431000	32500	36600
40-21224	11/1/94	1-2	27400	404	<3090	21900000	3920	1310	3540000	6540	14000	25300000	3240000	546000	18600	929000	453000	40100	44100
B40E1-6	11/14/02	6																	
B40E2-6	11/14/02	6																	
B40S1-6	11/14/02	6																	
B40S2-6	11/14/02	6																	
B40W1-6	11/14/02	6																	
B45CS2-6	11/14/02	6																	
B45CS3D-6	11/20/02	6																	
B45S2-7	11/18/02	7																	
B45S2-7 DUP	11/18/02	7																	
B45S3-7	11/18/02	7																	
B45S4-7	11/18/02	7																	
B45S6-6	11/18/02	6																	
B45S7-7	11/18/02	7																	
S26B1 10-11	2/3/98	10-11	8100	< 30	2500														
S26B1 2-3	2/3/98	2-3	7400	40	1200														
S26B1 7-9	2/3/98	7-9	11000	< 30	1800														
S26B2 3-4	2/5/98	3-4	10000	40	1600														
S26B2 7-8	2/5/98	7-8	7400	< 30	< 640														
S26B3 2-3	2/3/98	2-3	15000	30	1700														
S26B3 9-11	2/3/98	9-11	10000	< 30	1400														

Notes:
All concentrations in ug/kg (micrograms per kilogram)
< Less than detection limit shown
Blanks: Not analyzed
ND: Not detected
VOC: Volatile organic compound
TPH: Total petroleum hydrocarbon
GC/FID: Gas chromatograph/flame ionization detector
ORO: Oil range organic
ft bgs: Feet below ground surface
Lab qualifiers in Section 1.0

TABLE 2-5(a)
COMPARISON OF AVERAGE AND MAXIMUM SOIL CONCENTRATIONS IN AREA 1: RUNWAY PROTECTION ZONE TO BACKGROUND LEVELS
BOEING TRACT 1, ST. LOUIS, MISSOURI

COCs*	# of Samples	# of Detects	Concentration			Comparison to Background Level	
			Average (ug/kg)	Maximum (ug/kg)	Background (ug/kg)	Average	Maximum
Organics							
Acetone	11	6	25	73	NA	NA	NA
Benzene	21	7	32,196	258,000	NA	NA	NA
Ethylbenzene	21	1	32,056	663,000	NA	NA	NA
Toluene	21	8	195,660	3,980,000	NA	NA	NA
Xylenes, Total	23	5	130,160	2,970,000	NA	NA	NA
TPH							
Diesel # 1 - DRO	12	0	2,500	2,500	NA	NA	NA
Diesel # 2 - DRO	12	0	2,500	2,500	NA	NA	NA
Gasoline (C6-C14) - GRO	12	5	91,429	206,000	NA	NA	NA
Kerosene - DRO	12	0	2,500	2,500	NA	NA	NA
Motor Oil (C16-C33) - ORO	12	0	2,500	2,500	NA	NA	NA
Stoddard solvent - DRO	1	0	2,500	2,500	NA	NA	NA
TPH (GC/FID) High Fraction - DRO	1	0	2,000	2,000	NA	NA	NA
TPH (GC/FID) Low Fraction - GRO	7	0	250	250	NA	NA	NA
TPH (ORO) - ORO	4	4	60,000	117,000	NA	NA	NA
Summary of TPH Measurements							
TPH-GRO	19	5	57,836	206,000	NA	NA	NA
TPH-DRO	38	0	2,487	2,500	NA	NA	NA
TPH-ORO	16	4	16,875	117,000	NA	NA	NA
Metals							
Aluminum	4	4	18,600,000	21,900,000	41,000,000	Not Exceed	Not Exceed
Antimony	4	4	4,005	4,350	520	Exceed	Exceed
Arsenic	11	8	19,018	44,800	9,200	Exceed	Exceed
Barium	11	11	240,250	303,000	725,000	Not Exceed	Not Exceed
Beryllium	4	3	1,155	1,370	800	Exceed	Exceed
Calcium	4	4	4,075,000	5,420,000	3,300,000	Exceed	Exceed
Chromium	11	11	17,936	22,000	58,000	Not Exceed	Not Exceed
Cobalt	4	4	9,885	11,600	10,000	Not Exceed	Exceed
Copper	4	4	14,600	16,100	13,000	Exceed	Exceed
Iron	4	4	24,325,000	25,300,000	21,000,000	Exceed	Exceed
Lead	11	11	17,145	34,100	21,800	Not Exceed	Exceed
Magnesium	4	4	3,025,000	3,240,000	2,600,000	Exceed	Exceed
Manganese	4	4	1,338,750	2,580,000	740,000	Exceed	Exceed
Mercury	11	7	121	490	39	Exceed	Exceed
Nickel	4	4	23,075	28,700	14,000	Exceed	Exceed
Potassium	4	4	796,500	929,000	14,000,000	Not Exceed	Not Exceed
Selenium	11	6	1,518	2,500	260	Exceed	Exceed
Sodium	4	4	475,000	519,000	5,300,000	Not Exceed	Not Exceed
Vanadium	4	4	38,575	38,575	69,000	Not Exceed	Not Exceed
Zinc	4	4	42,300	46,500	49,000	Not Exceed	Not Exceed

Notes:
ug/kg: micrograms per kilogram
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic
ORO: Oil range organic
NA: Not available
GC/FID: Gas chromatograph/flame ionization detector

TABLE 2-5(b)
SUMMARY INFORMATION FOR CONSTITUENTS OF CONCERN (COCs) IN SOILS FOR AREA 1: RUNWAY PROTECTION ZONE
BOEING TRACT 1, ST. LOUIS, MISSOURI

COCs	# of Samples	# of Detects	Ratio Max. Detected to Average Conc.	Concentration			
				Max. Detected (ug/kg)	Average (ug/kg)	Maximum (ug/kg)	Background (ug/kg)
Organics							
Acetone	11	6	3.0	73	25	73	NA
Benzene	21	7	8.0	258,000	32,196	258,000	NA
Ethylbenzene	21	1	20.7	663,000	32,056	663,000	NA
Toluene	21	8	20.3	3,980,000	195,660	3,980,000	NA
Xylenes, Total	23	5	22.8	2,970,000	130,160	2,970,000	NA
TPH							
Diesel # 1 - DRO	12	0	N/A	ND	2,500	2,500	NA
Diesel # 2 - DRO	12	0	N/A	ND	2,500	2,500	NA
Gasoline (C6-C14) - GRO	12	5	2.3	206,000	91,429	206,000	NA
Kerosene - DRO	12	0	N/A	ND	2,500	2,500	NA
Motor Oil (C16-C33) - ORO	12	0	N/A	ND	2,500	2,500	NA
Stoddard solvent - DRO	1	0	N/A	ND	2,500	2,500	NA
TPH (GC/FID) High Fraction - DRO	1	0	N/A	ND	2,000	2,000	NA
TPH (GC/FID) Low Fraction - DRO	7	0	N/A	ND	250	250	NA
TPH (ORO) - ORO	4	4	2.0	117,000	60,000	117,000	NA
Summary of TPH Measurements							
TPH-GRO	19	5	3.6	206,000	57,836	206,000	NA
TPH-DRO	38	0	N/A	ND	2,487	2,500	NA
TPH-ORO	16	4	6.9	117,000	16,875	117,000	NA
Metals							
Antimony	4	4	1.1	4,350	4,005	4,350	520
Arsenic	11	8	2.4	44,800	19,018	44,800	9,200
Beryllium	4	3	1.2	1,370	1,155	1,370	800
Cobalt	4	4	1.2	11,600	9,885	11,600	10,000
Copper	4	4	1.1	16,100	14,600	16,100	13,000
Manganese	4	4	1.9	2,580,000	1,338,750	2,580,000	740,000
Mercury	11	7	4.0	490	121	490	39
Nickel	4	4	1.2	28,700	23,075	28,700	14,000
Selenium	11	6	1.6	2,500	1,518	2,500	260

Notes:
ug/kg: micrograms per kilogram
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic
ORO: Oil range organic
NA: Not available
ND: Not detected
N/A: Not applicable
GC/FID: Gas chromatograph/flame ionization detector
Max. Detected: Maximum of only detected concentratons
Maximum: Maximum of detected concentratons and 1/2 detection limits for non-detected constituents

TABLE 3
GROUNDWATER DATA FOR AREA 1: RUNWAY PROTECTION ZONE
BOEING TRACT 1, ST.LOUIS, MISSOURI

Sample ID	Date	Group	#6 Fuel Oil (C10-C32)	1,2,3-Trimethyl benzene	1,2,4-Trimethyl benzene	Acetone	Arsenic	Arsenic, Dissolved	Barium	Barium, Dissolved	Benzene
B40E1W	14-Nov-02	TPH									
B40E1W	14-Nov-02	VOCs			< 1						< 1
B40E2W	14-Nov-02	TPH									
B40E2W	14-Nov-02	VOCs			< 1						< 1
B40S1W	14-Nov-02	TPH									
B40S1W	14-Nov-02	VOCs			< 1						< 1
B40S2W	14-Nov-02	TPH									
B40S2W	14-Nov-02	VOCs			< 1						< 1
B40W1W	14-Nov-02	TPH									
B40W1W	14-Nov-02	VOCs			< 1						< 1
B45CMW-3AW	02-Jul-03	TPH	< 100								
B45CMW-3AW	02-Jul-03.	VOCs		3.4	1.7	< 50					< 1
B45CMW-3BW	26-Jun-03	TPH	< 100								
B45CMW-3BW	26-Jun-03	VOCs		< 1	< 1	< 50					< 1
B45CS1DW	15-Nov-02	TPH									
B45CS1DW	15-Nov-02	VOCs									< 5
B45CS2W	14-Nov-02	TPH									
B45CS2W	14-Nov-02	VOCs									< 5
B45CS3DW	20-Nov-02	TPH									
B45CS3DW	20-Nov-02	VOCs									< 0.5
B45S1DW	18-Nov-02	TPH									
B45S1DW	18-Nov-02	VOCs									< 5
B45S2W	18-Nov-02	TPH									
B45S2W	18-Nov-02	VOCs									29.4
B45S3W	18-Nov-02	TPH									
B45S3W	18-Nov-02	VOCs									23.5
B45S4W	18-Nov-02	TPH									
B45S4W	18-Nov-02	VOCs									< 5
B45S4W DUP	18-Nov-02	TPH									
B45S4W DUP	18-Nov-02	VOCs									< 5
B45S5DW	19-Nov-02	TPH									
B45S5DW	19-Nov-02	VOCs									< 5
B45S6W	18-Nov-02	TPH									
B45S6W	18-Nov-02	VOCs									< 5
B45S7W	19-Nov-02	TPH									
B45S7W	19-Nov-02	VOCs									6.7
MW-A15W	02-Jul-03	TPH	< 100								
MW-A15W	02-Jul-03	VOCs		< 10	< 10	< 500					34
MW-A17W	26-Jun-03	TPH	< 100								
MW-A17W	26-Jun-03	VOCs		< 1	< 1	60					< 1
MW-A18W	26-Jun-03	TPH	< 100								
MW-A18W	26-Jun-03	VOCs		< 1	< 1	< 50					< 1
MW-A18W	29-Jul-03	VOCs			< 5	< 20					< 5

TABL

GROUNDWATER DATA FOR AREA 1: RUNWAY PROTECTION ZONE
BOEING TRACT 1, ST.LOUIS, MISSOURI

Sample ID	Date	Group	#6 Fuel Oil (C10-C32)	1,2,3-Trimethyl benzene	1,2,4-Trimethyl benzene	Acetone	Arsenic	Arsenic, Dissolved	Barium	Barium, Dissolved	Benzene
MW-A1W	07-May-01	Metals					44		680		
MW-A1W	07-May-01	Metals, Dissolved						20		470	
MW-A1W	26-Jul-01	Metals					51		740		
MW-A1W	26-Jul-01	Metals, Dissolved						27		490	
MW-A1W	02-Jul-03	TPH	< 500								
MW-A1W	02-Jul-03	VOCs									< 0.5
MW-A22W	01-Nov-02	TPH	< 100								
MW-A22W	01-Nov-02	VOCs									2
MW-A22W	20-Mar-03	TPH									
MW-A22W	20-Mar-03	VOCs									1.4
MW-A23W	02-Jul-03	TPH	< 100								
MW-A23W	02-Jul-03	VOCs									28
MW-A23W	29-Jul-03	VOCs			< 5	< 20					29
MW-A27W	01-Nov-02	TPH	< 100								
MW-A27W	01-Nov-02	VOCs									< 0.5
MW-A27W	29-Jul-03	VOCs			< 5	< 20					< 5
MW-A3W	26-Jun-03	TPH	< 100								
MW-A3W	26-Jun-03	VOCs		< 1	< 1	< 50					< 1

Notes:
All concentrations in ug/L (micrograms per liter)
< Less than detection limit shown
ND: Non-detect
Blank: Not analyzed
VOC: Volatile organic compound
TPH: Total petroleum hydrocarbon
GC/FID: Gas chromatograph/flame ionization detector
Lab qualifiers in Section 1.0

TABLE 6
GROUNDWATER DATA FOR AREA 1: RUNWAY PROTECTION ZONE
BOEING TRACT 1, ST.LOUIS, MISSOURI

Sample ID	Date	Group	Chromium	Chromium, Dissolved	Diesel #1	Diesel #2	Diesel (C7-C26)	Ethylbenzene	Gasoline (C6-C14)	Hydraulic Fluid (C12-C33)	Isopropyl benzene
B40E1W	14-Nov-02	TPH			< 1000	< 1000					
B40E1W	14-Nov-02	VOCs						< 1			< 1
B40E2W	14-Nov-02	TPH			< 1000	< 1000					
B40E2W	14-Nov-02	VOCs						< 1			< 1
B40S1W	14-Nov-02	TPH			< 1000	< 1000					
B40S1W	14-Nov-02	VOCs						< 1			< 1
B40S2W	14-Nov-02	TPH			< 1000	< 1000					
B40S2W	14-Nov-02	VOCs						< 1			< 1
B40W1W	14-Nov-02	TPH			< 1000	< 1000					
B40W1W	14-Nov-02	VOCs						< 1			< 1
B45CMW-3AW	02-Jul-03	TPH					< 100			< 100	
B45CMW-3AW	02-Jul-03	VOCs						< 1			< 1
B45CMW-3BW	26-Jun-03	TPH					< 100			< 100	
B45CMW-3BW	26-Jun-03	VOCs						< 1			< 1
B45CS1DW	15-Nov-02	TPH			< 1000	< 1000			< 1000		
B45CS1DW	15-Nov-02	VOCs						< 5			
B45CS2W	14-Nov-02	TPH			< 1000	< 1000			< 1000		
B45CS2W	14-Nov-02	VOCs						< 5			
B45CS3DW	20-Nov-02	TPH									
B45CS3DW	20-Nov-02	VOCs						< 0.5			
B45S1DW	18-Nov-02	TPH			< 1000	< 1000			< 1000		
B45S1DW	18-Nov-02	VOCs						< 5			
B45S2W	18-Nov-02	TPH			< 1000	< 1000			15310		
B45S2W	18-Nov-02	VOCs						< 5			
B45S3W	18-Nov-02	TPH			< 1000	< 1000			2760		
B45S3W	18-Nov-02	VOCs						< 5			
B45S4W	18-Nov-02	TPH			< 1000	< 1000			< 1000		
B45S4W	18-Nov-02	VOCs						< 5			
B45S4W DUP	18-Nov-02	TPH			< 1000	< 1000			< 1000		
B45S4W DUP	18-Nov-02	VOCs						< 5			
B45S5DW	19-Nov-02	TPH			< 1000	< 1000			< 1000		
B45S5DW	19-Nov-02	VOCs						< 5			
B45S6W	18-Nov-02	TPH			< 1000	< 1000			< 1000		
B45S6W	18-Nov-02	VOCs						< 5			
B45S7W	19-Nov-02	TPH			< 1000	< 1000			41410		
B45S7W	19-Nov-02	VOCs						< 5			
MW-A15W	02-Jul-03	TPH					< 100			< 100	
MW-A15W	02-Jul-03	VOCs						< 10			14
MW-A17W	26-Jun-03	TPH					< 100			< 100	
MW-A17W	26-Jun-03	VOCs						< 1			< 1
MW-A18W	26-Jun-03	TPH					< 100			< 100	
MW-A18W	26-Jun-03	VOCs						< 1			< 1
MW-A18W	29-Jul-03	VOCs						< 5			< 5

TABLE 6

GROUNDWATER DATA FOR AREA 1: RUNWAY PROTECTION ZONE

BOEING TRACT 1, ST.LOUIS, MISSOURI

Sample ID	Date	Group	Chromium	Chromium, Dissolved	Diesel #1	Diesel #2	Diesel (C7-C26)	Ethylbenzene	Gasoline (C6-C14)	Hydraulic Fluid (C12-C33)	Isopropyl benzene
MW-A1W	07-May-01	Metals	16								
MW-A1W	07-May-01	Metals, Dissolved		2.6							
MW-A1W	26-Jul-01	Metals	21								
MW-A1W	26-Jul-01	Metals, Dissolved		2.4							
MW-A1W	02-Jul-03	TPH					< 500			< 500	
MW-A1W	02-Jul-03	VOCs						1			
MW-A22W	01-Nov-02	TPH					< 100			< 100	
MW-A22W	01-Nov-02	VOCs						2.8			
MW-A22W	20-Mar-03	TPH									
MW-A22W	20-Mar-03	VOCs						< 0.5			
MW-A23W	02-Jul-03	TPH					< 100			< 100	
MW-A23W	02-Jul-03	VOCs						0.64			
MW-A23W	29-Jul-03	VOCs						< 5			26
MW-A27W	01-Nov-02	TPH					< 100			< 100	
MW-A27W	01-Nov-02	VOCs						< 0.5			
MW-A27W	29-Jul-03	VOCs						< 5			< 5
MW-A3W	26-Jun-03	TPH					< 100			< 100	
MW-A3W	26-Jun-03	VOCs						< 1			5.5

Notes:

All concentrations in ug/L (micrograms per liter)

< Less than detection limit shown

ND: Non-detect

Blank: Not analyzed

VOC: Volatile organic compound

TPH: Total petroleum hydrocarbon

GC/FID: Gas chromatograph/flame ionization detector

Lab qualifiers in Section 1.0

TABLE 6
GROUNDWATER DATA FOR AREA 1: RUNWAY PROTECTION ZONE
BOEING TRACT 1, ST.LOUIS, MISSOURI

Sample ID	Date	Group	Kerosene	Kerosene (C9-C16)	Lead	Lead, Dissolved	Methyl tert-butyl ether	Mineral Spirits (C7-C14)	Misc_TPH (C10-C40)	Motor Oil (C16-C33)	Naphthalene	n-Butyl benzene
B40E1W	14-Nov-02	TPH	< 1000							< 1000		
B40E1W	14-Nov-02	VOCs									< 1	< 1
B40E2W	14-Nov-02	TPH	< 1000							< 1000		
B40E2W	14-Nov-02	VOCs									< 1	< 1
B40S1W	14-Nov-02	TPH	< 1000							< 1000		
B40S1W	14-Nov-02	VOCs									< 1	< 1
B40S2W	14-Nov-02	TPH	< 1000							< 1000		
B40S2W	14-Nov-02	VOCs									< 1	< 1
B40W1W	14-Nov-02	TPH	< 1000							< 1000		
B40W1W	14-Nov-02	VOCs									< 1	< 1
B45CMW-3AW	02-Jul-03	TPH		< 100				< 100	9500	< 100		
B45CMW-3AW	02-Jul-03	VOCs					< 5				< 5	< 1
B45CMW-3BW	26-Jun-03	TPH		< 100				< 100	1400	< 100		
B45CMW-3BW	26-Jun-03	VOCs					< 1				5.3	< 1
B45CS1DW	15-Nov-02	TPH	< 1000							< 1000		
B45CS1DW	15-Nov-02	VOCs					< 5					
B45CS2W	14-Nov-02	TPH	< 1000							< 1000		
B45CS2W	14-Nov-02	VOCs					< 5					
B45CS3DW	20-Nov-02	TPH										
B45CS3DW	20-Nov-02	VOCs					< 5					
B45S1DW	18-Nov-02	TPH	< 1000							< 1000		
B45S1DW	18-Nov-02	VOCs					< 5					
B45S2W	18-Nov-02	TPH	< 1000							< 1000		
B45S2W	18-Nov-02	VOCs					< 5					
B45S3W	18-Nov-02	TPH	< 1000							< 1000		
B45S3W	18-Nov-02	VOCs					< 5					
B45S4W	18-Nov-02	TPH	< 1000							< 1000		
B45S4W	18-Nov-02	VOCs					< 5					
B45S4W DUP	18-Nov-02	TPH	< 1000							< 1000		
B45S4W DUP	18-Nov-02	VOCs					< 5					
B45S5DW	19-Nov-02	TPH	< 1000							< 1000		
B45S5DW	19-Nov-02	VOCs					< 5					
B45S6W	18-Nov-02	TPH	< 1000							< 1000		
B45S6W	18-Nov-02	VOCs					< 5					
B45S7W	19-Nov-02	TPH	< 1000							< 1000		
B45S7W	19-Nov-02	VOCs					< 5					
MW-A15W	02-Jul-03	TPH		< 100				< 100	810	< 100		
MW-A15W	02-Jul-03	VOCs					<10				< 50	< 10
MW-A17W	26-Jun-03	TPH		< 100				< 100	160	< 100		
MW-A17W	26-Jun-03	VOCs					< 1				< 5	< 1
MW-A18W	26-Jun-03	TPH		< 100				< 100	J3J4 210	< 100		
MW-A18W	26-Jun-03	VOCs					< 1				< 5	< 1
MW-A18W	29-Jul-03	VOCs					< 10				< 10	< 5

TABL[illegible]6

GROUNDWATER DATA FOR AREA 1: RUNWAY PROTECTION ZONE

BOEING TRACT 1, ST.LOUIS, MISSOURI

Sample ID	Date	Group	Kerosene	Kerosene (C9-C16)	Lead	Lead, Dissolved	Methyl tert-butyl ether	Mineral Spirits (C7-C14)	Misc_TPH (C10-C40)	Motor Oil (C16-C33)	Naphthalene	n-Butyl benzene
MW-A1W	07-May-01	Metals			15							
MW-A1W	07-May-01	Metals, Dissolved				< 5						
MW-A1W	26-Jul-01	Metals			14							
MW-A1W	26-Jul-01	Metals, Dissolved				9.4						
MW-A1W	02-Jul-03	TPH		< 500				< 500	19000	< 500		
MW-A1W	02-Jul-03	VOCs					11					
MW-A22W	01-Nov-02	TPH		< 100				< 100	840	< 100		
MW-A22W	01-Nov-02	VOCs					< 5					
MW-A22W	20-Mar-03	TPH										
MW-A22W	20-Mar-03	VOCs					< 5					
MW-A23W	02-Jul-03	TPH		< 100				< 100	3900	< 100		
MW-A23W	02-Jul-03	VOCs					< 5					
MW-A23W	29-Jul-03	VOCs					< 10				< 10	8.1
MW-A27W	01-Nov-02	TPH		< 100				< 100	1300	< 100		
MW-A27W	01-Nov-02	VOCs					< 5					
MW-A27W	29-Jul-03	VOCs					< 10				< 10	< 5
MW-A3W	26-Jun-03	TPH		< 100				< 100	9500	< 100		
MW-A3W	26-Jun-03	VOCs					5.1				< 5	< 1

Notes:

All concentrations in ug/L (micrograms per liter)

< Less than detection limit shown

ND: Non-detect

Blank: Not analyzed

VOC: Volatile organic compound

TPH: Total petroleum hydrocarbon

GC/FID: Gas chromatograph/flame ionization detector

Lab qualifiers in Section 1.0

TABLE 2-6
GROUNDWATER DATA FOR AREA 1: RUNWAY PROTECTION ZONE
BOEING TRACT 1, ST.LOUIS, MISSOURI

Sample ID	Date	Group	n-Propyl benzene	p-Isopropyl toluene	sec-Butyl benzene	Stoddard Solvent	tert-Butyl benzene	Toluene	TPH (GC/FID) High Fraction	TPH (GC/FID) Low Fraction	Trichloro-ethene	Xylenes, Total
B40E1W	14-Nov-02	TPH				< 1000						
B40E1W	14-Nov-02	VOCs	< 1	< 1	< 1		< 1	< 1			1.1	
B40E2W	14-Nov-02	TPH				< 1000						
B40E2W	14-Nov-02	VOCs	< 1	< 1	< 1		< 1	< 1			< 1	
B40S1W	14-Nov-02	TPH				< 1000						
B40S1W	14-Nov-02	VOCs	< 1	< 1	< 1		< 1	< 1			< 1	
B40S2W	14-Nov-02	TPH				< 1000						
B40S2W	14-Nov-02	VOCs	< 1	< 1	< 1		< 1	< 1			< 1	
B40W1W	14-Nov-02	TPH				< 1000						
B40W1W	14-Nov-02	VOCs	< 1	< 1	< 1		< 1	< 1			< 1	
B45CMW-3AW	02-Jul-03	TPH								220		
B45CMW-3AW	02-Jul-03	VOCs	< 1	1	1.1		< 1	< 5			< 1	<1.5
B45CMW-3BW	26-Jun-03	TPH								160		
B45CMW-3BW	26-Jun-03	VOCs	< 1	< 1	< 1		< 1	< 5			< 1	< 3
B45CS1DW	15-Nov-02	TPH				< 1000						
B45CS1DW	15-Nov-02	VOCs						< 5				< 5
B45CS2W	14-Nov-02	TPH				< 1000						
B45CS2W	14-Nov-02	VOCs						< 5				< 5
B45CS3DW	20-Nov-02	TPH							< 100	< 100		
B45CS3DW	20-Nov-02	VOCs						< 5				< 1.5
B45S1DW	18-Nov-02	TPH				< 1000						
B45S1DW	18-Nov-02	VOCs						< 5				< 5
B45S2W	18-Nov-02	TPH				< 1000						
B45S2W	18-Nov-02	VOCs						54.8				< 5
B45S3W	18-Nov-02	TPH				< 1000						
B45S3W	18-Nov-02	VOCs						18.6				< 5
B45S4W	18-Nov-02	TPH				< 1000						
B45S4W	18-Nov-02	VOCs						< 5				< 5
B45S4W DUP	18-Nov-02	TPH				< 1000						
B45S4W DUP	18-Nov-02	VOCs						< 5				< 5
B45S5DW	19-Nov-02	TPH				< 1000						
B45S5DW	19-Nov-02	VOCs						< 5				< 5
B45S6W	18-Nov-02	TPH				< 1000						
B45S6W	18-Nov-02	VOCs						< 5				< 5
B45S7W	19-Nov-02	TPH				< 1000						
B45S7W	19-Nov-02	VOCs						10.1				8.4
MW-A15W	02-Jul-03	TPH								610		
MW-A15W	02-Jul-03	VOCs	12	< 10	< 10		< 10	< 50			< 10	< 30
MW-A17W	26-Jun-03	TPH								< 100		
MW-A17W	26-Jun-03	VOCs	< 1	< 1	< 1		< 1	< 5			< 1	< 3
MW-A18W	26-Jun-03	TPH								< 100		
MW-A18W	26-Jun-03	VOCs	< 1	< 1	< 1		< 1	< 5			< 1	< 3
MW-A18W	29-Jul-03	VOCs	< 5	< 5	< 5		<5	< 5			< 5	

TABLE 2-6
GROUNDWATER DATA FOR AREA 1: RUNWAY PROTECTION ZONE
BOEING TRACT 1, ST.LOUIS, MISSOURI

Sample ID	Date	Group	n-Propyl benzene	p-Isopropyl toluene	sec-Butyl benzene	Stoddard Solvent	tert-Butyl benzene	Toluene	TPH (GC/FID) High Fraction	TPH (GC/FID) Low Fraction	Trichloro-ethene	Xylenes, Total
MW-A1W	07-May-01	Metals										
MW-A1W	07-May-01	Metals, Dissolved										
MW-A1W	26-Jul-01	Metals										
MW-A1W	26-Jul-01	Metals, Dissolved										
MW-A1W	02-Jul-03	TPH								1900		
MW-A1W	02-Jul-03	VOCs						< 5				2.1
MW-A22W	01-Nov-02	TPH								1700		
MW-A22W	01-Nov-02	VOCs						< 5				11
MW-A22W	20-Mar-03	TPH								190		
MW-A22W	20-Mar-03	VOCs						< 5				< 1.5
MW-A23W	02-Jul-03	TPH								3400		
MW-A23W	02-Jul-03	VOCs						< 5				2.6
MW-A23W	29-Jul-03	VOCs	31	< 5	12		<5	< 5			< 5	
MW-A27W	01-Nov-02	TPH								< 100		
MW-A27W	01-Nov-02	VOCs						< 5				< 1.5
MW-A27W	29-Jul-03	VOCs	< 5	< 5	< 5		<5	< 5			< 5	
MW-A3W	26-Jun-03	TPH								3800		
MW-A3W	26-Jun-03	VOCs	7.8	5.4	5.1		2.3	< 5			< 1	< 3

Notes:
All concentrations in ug/L (micrograms per liter)
< Less than detection limit shown
ND: Non-detect
Blank: Not analyzed
VOC: Volatile organic compound
TPH: Total petroleum hydrocarbon
GC/FID: Gas chromatograph/flame ionization detector
Lab qualifiers in Section 1.0

TABLE 2-7(a)
COMPARISON OF AVERAGE AND MAXIMUM GROUNDWATER CONCENTRATIONS IN AREA 1: RUNWAY PROTECTION ZONE TO MAXIMUM CONTAMINANT LEVEL (MCL) OR EQUIVALENT
BOEING TRACT 1, ST. LOUIS, MISSOURI

COCs	# of Samples	# of Detects	Concentration			Comparison to MCL or Equivalent	
			Average (ug/L)	Maximum (ug/L)	MCL or Equivalent (ug/L)	Average	Maximum
Organics							
1,2,3-Trimethylbenzene	6	1	1.7	5	NA	NA	NA
1,2,4-Trimethylbenzene	14	1	1.2	5	2.59	Not Exceed	Exceed
Acetone	9	1	48.9	250	121	Not Exceed	Exceed
Benzene	30	8	6.1	34	5	Exceed	Exceed
Ethylbenzene	30	3	1.6	5	700	Not Exceed	Not Exceed
Isopropylbenzene	14	3	3.9	26	4,000	Not Exceed	Not Exceed
Methyl tert-butyl ether	25	2	3.1	11	146	Not Exceed	Not Exceed
Naphthalene	14	1	4.1	25	100	Not Exceed	Not Exceed
n-Butylbenzene	14	1	1.7	8.1	48.6	Not Exceed	Not Exceed
n-Propylbenzene	14	2	4.3	31	5.3	Not Exceed	Exceed
p-Isopropyltoluene	14	2	1.6	5.4	107	Not Exceed	Not Exceed
sec-Butylbenzene	14	3	2.3	12	48.6	Not Exceed	Not Exceed
Toluene	30	3	5.5	54.8	1,000	Not Exceed	Not Exceed
tert-Butylbenzene	14	1	1.4	5	48.6	Not Exceed	Not Exceed
Trichloroethene	14	1	1.3	5	5	Not Exceed	Not Exceed
Xylenes, Total	22	4	3.2	15	10,000	Not Exceed	Not Exceed
TPH							
#6 Fuel Oil (C10-C32) - ORO	10	0	70	250	NA	NA	NA
Diesel #1 - DRO	15	0	500	500	NA	NA	NA
Diesel #2 - DRO	15	0	500	500	NA	NA	NA
Diesel (C7-C26) - DRO	10	0	70	250	NA	NA	NA
Gasoline (C6-C14) - GRO	10	3	6,298	41,410	NA	NA	NA
Hydraulic Fluid (C12-C33) - ORO	10	0	70	250	NA	NA	NA
Kerosene - DRO	15	0	500	500	NA	NA	NA
Kerosene (C9-C16) - DRO	10	0	70	250	NA	NA	NA
Mineral Spirits (C7-C14) - DRO	10	0	70	250	NA	NA	NA
Misc_TPH (C10-C40) - ORO	10	9	4,652	19,000	NA	NA	NA
Motor Oil (C16-C33) - ORO	25	0	328	500	NA	NA	NA
Stoddard Solvent - DRO	15	0	500	500	NA	NA	NA
TPH (GC/FID) High Fraction - DRO	1	0	50	50	NA	NA	NA
TPH (GC/FID) Low Fraction - GRO	12	8	1,015	3,800	NA	NA	NA
Summary of TPH Measurements							
TPH-GRO	22	11	3,416	41,410	NA	NA	NA
TPH-DRO	91	0	353	500	NA	NA	NA
TPH-ORO	55	9	1,020	19,000	NA	NA	NA
Total Metals							
Arsenic	2	2	47.5	51	10	Exceed	Exceed
Barium	2	2	710	740	2,000	Not Exceed	Not Exceed
Chromium	2	2	18.5	21	100	Not Exceed	Not Exceed
Lead	2	2	14.5	15	15	Not Exceed	Not Exceed

Notes:
ug/L: micrograms per liter
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic
ORO: Oil range organic
NA: Not available
GC/FID: Gas chromatograph/flame ionization detector

TABLE 2-7(b)
SUMMARY INFORMATION FOR CONSTITUENTS OF CONCERN (COCs) IN GROUNDWATER FOR AREA 1: RUNWAY PROTECTION ZONE
BOEING TRACT 1, ST. LOUIS, MISSOURI

COCs	# of Samples	# of Detects	Ratio Max. Detected to Average Conc.	Concentration			
				Max. Detected (ug/L)	Average (ug/L)	Maximum (ug/L)	MCL or Equivalent (ug/L)
Organics							
1,2,3-Trimethylbenzene	6	1	2.0	3.4	1.7	5	NA
1,2,4-Trimethylbenzene	14	1	1.4	1.7	1.2	5	2.59
Acetone	9	1	1.2	60	48.9	250	121
Benzene	30	8	5.6	34	6.1	34	5
n-Propylbenzene	14	2	7.2	31	4.3	31	5.27
TPH							
#6 Fuel Oil (C10-C32) - ORO	10	0	N/A	ND	70	250	NA
Diesel #1 - DRO	15	0	N/A	ND	500	500	NA
Diesel #2 - DRO	15	0	N/A	ND	500	500	NA
Diesel (C7-C26) - DRO	10	0	N/A	ND	70	250	NA
Gasoline (C6-C14) - GRO	10	3	6.6	41,410	6,298	41,410	NA
Hydraulic Fluid (C12-C33) - ORO	10	0	N/A	ND	70	250	NA
Kerosene - DRO	15	0	N/A	ND	500	500	NA
Kerosene (C9-C16) - DRO	10	0	N/A	ND	70	250	NA
Mineral Spirits (C7-C14) - DRO	10	0	N/A	ND	70	250	NA
Misc_TPH (C10-C40) - ORO	10	9	4.1	19,000	4,652	19,000	NA
Motor Oil (C16-C33) - ORO	25	0	N/A	ND	328	500	NA
Stoddard Solvent - DRO	15	0	N/A	ND	500	500	NA
TPH (GC/FID) High Fraction - DRO	1	0	N/A	ND	50	50	NA
TPH (GC/FID) Low Fraction - GRO	12	8	3.7	3,800	1,015	3,800	NA
Summary of TPH Measurements							
TPH-GRO	22	11	12.1	41,410	3,416	41,410	NA
TPH-DRO	91	0	N/A	ND	353	500	NA
TPH-ORO	55	0	N/A	ND	1,020	500	NA
Metals							
Arsenic	2	2	1.1	51	47.5	51	10

Notes:
ug/L: micrograms per liter
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic
ORO: Oil range organic
NA: Not available
ND: Not detected
N/A: Not applicable
GC/FID: Gas chromatograph/flame ionization detector
Max. Detected: Maximum of only detected concentratons
Maximum: Maximum of detected concentratons and 1/2 detection limits for non-detected constituents

TABLE 2-8(R)
HISTORICAL GROUNDWATER DATA, AREA 1: RUNWAY PROTECTION ZONE
BOEING TRACT 1, ST. LOUIS, MISSOURI

Well	Sampling Date	Benzene (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Xylenes (ug/L)
MW-A1	1/20/1990	630	<5	<15	26
	6/5/1990	260	<5	<5	<15
	1/10/1991	180	<5	10	10
	6/20/1991	<5	<5	<5	<15
	7/6/1993	<5	<5	<5	<15
	4/26/1994	<5	<5	<5	<15
	1/13/1995	<5	<5	<5	<15
	12/27/1996	7	<5	<5	3
	7/14/1997	<5	<5	<5	<15
	1/29/1998	<5	<5	<5	<15
	1/5/1999	<5	<5	<5	<15
	10/22/2001	<5	<5	<5	<15
	7/2/2003	<0.5	<5	1	2.1
MW-A2	1/20/1990	200	0	100	100
	6/5/1990	670	23	95	145
	1/10/1991	450	10	90	210
	6/20/1991	40	<5	<5	<15
	7/6/1993	<5	<5	<5	2
MW-A3	1/20/1990	11	<5	27	<15
	6/5/1990	<5	<5	<5	<15
	6/20/1991	<5	<5	<5	<15
	7/6/1993	<5	<5	3	3
	4/26/1994	7	<5	<5	36
	1/13/1995	16	2	<5	24
	12/27/1996	2	5	<5	21
	7/14/1997	<5	<5	<5	<15
	1/29/1998	20	34	<5	80
	1/5/1999	<5	<5	<5	27
	10/22/2001	<5	<5	<5	<15
	6/26/2003	<1	<5	<1	<3
MW-A18	1/20/1990	570	<5	1500	330
	6/5/1990	9	<5	<5	130
	6/20/1991	75	<5	8	<40
	7/6/1993	<5	<5	1	<15
	4/26/1994	<5	<5	<5	<15
	1/13/1995	<5	<5	<5	<15
	12/27/1996	<5	<5	<5	<15
	7/14/1997	<5	<5	<5	<15
	1/29/1998	<5	<5	<5	<15
	1/5/1999	<5	<5	<5	<15
	6/26/2003	<1	<5	<1	<3
	7/29/2003	<5	<5	<5	NA
MW-A21	6/5/1990	17	<5	<5	32
B45CMW-3A	6/20/1991	<5	<5	<5	<15
	7/6/1993	<5	<5	<5	<15
	4/26/1994	<5	<5	<5	<15
	1/13/1995	<5	<5	<5	<15
	12/27/1996	<5	<5	<5	79
	7/14/1997	<5	19	13	195
	1/29/1998	<5	10	<5	110
	1/5/1999	<5	<5	<5	54
	10/22/2001	<5	<5	6.3	<15
	7/2/2003	<1	<5	<1	<1.5

TABLE 2-8(R)
HISTORICAL GROUNDWATER DATA, AREA 1: RUNWAY PROTECTION ZONE
BOEING TRACT 1, ST. LOUIS, MISSOURI

B45CMW-3B	6/20/1991	<5	<5	<5	<15
	7/6/1993	<5	<5	<5	<15
	4/26/1994	<5	<5	<5	<15
	1/13/1995	<5	<5	<5	<15
	12/27/1996	<5	5	<5	44
	7/14/1997	<5	<5	<5	25
	1/29/1998	<5	9	<5	24
	1/5/1999	<5	6	<5	<15
	6/26/2003	<1	<5	<1	<3
MW-A5	6/5/1990	36000	140	19000	3500
	1/10/1991	7000	10	950	900
	7/6/1993	23000	<5	4	11000
MW-A14	6/5/1990	28000	7500	14000	75000
	1/10/1991	8000	900	2300	1500
MW-A15	6/5/1990	18000	600	19000	8000
	1/10/1991	8700	400	2400	1000
	6/20/1991	180	<5	<5	45
	7/6/1993	5800	<5	16	315
	4/26/1994	1520	<25	<25	267
	1/13/1995	756	106	14	26
	12/27/1996	142	15	<5	2
	7/14/1997	129	6	<5	<15
	1/29/1998	240	15	<5	<15
	1/5/1999	54	<5	<5	<15
	6/13/2000	173	<5	<5	<15
	4/30/2002	42.2	<5	<5	<5
	7/2/2003	34	<30	<10	<30
MW-A22	6/5/1990	2000	15	3000	3300
	1/10/1991	500	250	300	200
	6/20/1991	<5	<5	<5	40
	7/6/1993	2	<5	1	<15
	4/26/1994	<5	<5	<5	<15
	1/13/1995	14	18	<5	19
	12/27/1996	2	3	<5	<15
	7/14/1997	23	5	<5	<15
	1/29/1998	<5	<5	<5	<15
	11/1/2002	2	<5	2.8	11
	3/20/2003	1.4	<5	<0.5	<1.5
MW-A23	6/5/1990	25000	700	900	1000
	1/10/1991	20000	1100	100	400
	6/20/1991	150	<5	<5	<15
	7/6/1993	14500	<5	2	960
	4/26/1994	3755	<25	<25	267
	1/13/1995	1900	327	<10	209
	12/27/1996	617	22	<5	7
	7/14/1997	<5	<5	<5	<15
	1/29/1998	<5	<5	<25	<15
	1/5/1999	25	<5	<5	<15
	6/13/2000	<5	<5	<5	<15
	4/30/2002	15.2	<5	<5	<5
	7/2/2003	28	<5	0.64	2.6
	7/29/2003	29	<5	<5	NA
MW-A24	6/5/1990	10500	<5	900	1300
	1/10/1991	9000	40	90	150
	6/20/1991	<5	<5	<5	<15
	7/6/1993	128	<5	<5	128
	4/26/1994	<5	<5	<5	<15
	1/13/1995	8	<5	<5	24
	12/27/1996	3	5	<5	<15
	7/14/1997	<5	13	<5	<15
	1/29/1998	<5	<5	<5	<15
	1/5/1999	<5	<5	<5	<15

TABLE 2-8(R)
HISTORICAL GROUNDWATER DATA, AREA 1: RUNWAY PROTECTION ZONE
BOEING TRACT 1, ST. LOUIS, MISSOURI

MW-A25	6/5/1990	<5	<5	<5	<15
	6/20/1991	<5	<5	<5	<15
	7/6/1993	4	<5	<5	<15
	4/26/1994	<5	<5	<5	<15
	1/13/1995	<5	<5	<5	<15
	12/27/1996	<5	<5	<5	<15
	7/14/1997	<5	<5	<5	<15
	1/29/1998	<5	<5	<5	<15
MW-A26	1/24/1990	<5	<5	<5	<15
	6/5/1990	<5	<5	<5	<15
	6/20/1991	<5	<5	<5	<15
	7/6/1993	<5	<5	<5	<15
	4/26/1994	<5	<5	<5	<15
	1/13/1995	14	5	1	3
	12/27/1996	15	3	<5	3
	7/14/1997	<5	<5	<5	<15
	1/29/1998	9	<5	<5	<15
	1/5/1999	<5	<5	<5	<15
MW-A27	1/24/1990	79	<5	20	145
	6/5/1990	<5	<5	<5	<15
	6/20/1991	<5	<5	<5	<15
	7/6/1993	<5	<5	<5	2
	4/26/1994	<5	<5	<5	<15
	1/13/1995	<5	<5	<5	<15
	12/27/1996	<5	<5	<5	<15
	7/14/1997	<5	<5	<5	<15
	11/1/2002	<0.5	<5	<0.50	<1.5
	7/29/2003	<5	<5	<5	NA
MW-A28	6/5/1990	23000	10	25	6000
	6/20/1991	2700	<5	<5	30
	7/6/1993	7400	<5	<5	11
	4/26/1994	2380	<25	<25	<75
	1/13/1995	2950	19	<5	4
	12/27/1996	670	<5	3	7
	7/14/1997	630	39	<5	<15
	1/29/1998	367	13	<5	<15
	1/5/1999	194	<5	<5	<15
	6/13/2000	64	<5	<5	<15
	4/30/2002	<2	2.8	<5	<5
MW-A29	6/5/1990	<5	<5	<5	<15
	6/20/1991	<5	<5	<5	<15
	7/6/1993	68	<5	<5	<15
	4/26/1994	<5	<5	<5	<15
	1/13/1995	<5	<5	<5	<15
	12/27/1996	<5	<5	<5	<15
	7/14/1997	<5	<5	<5	<15
	1/29/1998	<5	<5	<5	<15
	1/5/1999	<5	<5	<5	<15

Note:
< Less than detection limit shown
ug/L: micrograms per liter
NA: Not available

TABLE 2-9(R)

CALCULATION OF INDIVIDUAL EXCESS LIFETIME CANCER RISK (IELCR) AND HAZARDARD QUOTIENT (HQ) FOR A FUTURE CONSTRUCTION WORKER

AREA 1: RUNWAY PROTECTION ZONE, BOEING TRACT 1, ST. LOUIS, MISSOURI

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
1,2,3-Trimethylbenzene	---	---	---	---	---	---	---	1.7	NA	NA	NA	3.33E-07	NA	3.33E-07
1,2,4-Trimethylbenzene	---	---	---	---	---	---	---	1.2	NA	NA	NA	3.50E-07	NA	3.50E-07
Acetone	25	NA	8.72E-08	NA	9.20E-08	NA	2.06E-07	48.9	NA	NA	NA	9.93E-08	NA	4.85E-07
Benzene	32,196	4.65E-09	3.74E-03	5.17E-09	4.16E-03	2.43E-08	3.45E-02	6.1	1.17E-09	9.45E-04	1.47E-12	2.09E-06	3.53E-08	4.33E-02
Ethylbenzene	32,056	NA	1.12E-04	NA	1.14E-04	NA	9.20E-05	---	---	---	---	---	NA	3.18E-04
n-Propylbenzene	---	---	---	---	---	---	---	4.3	NA	NA	NA	7.93E-08	NA	7.93E-08
Toluene	195,660	NA	3.41E-05	NA	3.79E-04	NA	1.98E-03	---	---	---	---	---	NA	2.39E-03
Xylenes, Total	130,160	NA	2.27E-05	NA	2.32E-05	NA	4.77E-04	---	---	---	---	---	NA	5.23E-04
Organics Total Risk		**4.65E-09**	**3.91E-03**	**5.17E-09**	**4.68E-03**	**2.43E-08**	**3.70E-02**		**1.17E-09**	**9.45E-04**	**1.47E-12**	**2.95E-06**	**3.53E-08**	**4.66E-02**
TPH-GRO	57,836	NA	9.57E-05	NA	2.63E-04	NA	3.13E-04	3,416	NA	NA	NA	5.75E-04	NA	1.25E-03
TPH-DRO	2,500	NA	6.24E-06	NA	1.68E-05	NA	4.42E-06	353	NA	NA	NA	1.92E-03	NA	1.95E-03
TPH-ORO	16,875	NA	8.50E-05	NA	2.18E-04	NA	1.15E-06	1,020	NA	NA	NA	2.69E-06	NA	3.07E-04
TPH Total Risk		**NA**	**1.87E-04**	**NA**	**4.98E-04**	**NA**	**3.19E-04**		**NA**	**NA**	**NA**	**2.50E-03**	**NA**	**3.50E-03**
Antimony	4,005	NA	1.16E-05	NA	3.88E-04	NA	4.65E-07	---	---	---	---	---	NA	4.00E-04
Arsenic	19,018	4.74E-10	7.37E-05	1.50E-07	2.33E-02	2.69E-11	4.19E-07	47.5	NA	NA	NA	NA	1.51E-07	2.34E-02
Beryllium	1,155	8.25E-10	6.71E-06	2.75E-10	2.24E-06	9.16E-13	1.34E-09	---	---	---	---	---	1.10E-09	8.95E-06
Cobalt	9,885	NA	5.75E-04	NA	1.92E-04	9.15E-12	1.15E-05	---	---	---	---	---	9.15E-12	7.78E-04
Copper	14,600	NA	4.24E-06	NA	1.41E-04	NA	3.38E-07	---	---	---	---	---	NA	1.46E-04
Manganese	1,338,750	NA	3.33E-03	NA	3.70E-03	NA	6.32E-04	---	---	---	---	---	NA	7.67E-03
Mercury	121	NA	4.69E-07	NA	2.34E-05	NA	1.85E-04	---	---	---	---	---	NA	2.09E-04
Nickel	23,075	NA	6.71E-07	NA	4.47E-05	1.83E-12	2.67E-06	---	---	---	---	---	1.83E-12	4.80E-05
Selenium	1,518	NA	3.53E-05	NA	9.41E-05	NA	3.51E-06	---	---	---	---	---	NA	1.33E-04
Metals Total Risk		**1.30E-09**	**4.04E-03**	**1.50E-07**	**2.79E-02**	**3.88E-11**	**8.36E-04**		**NA**	**NA**	**NA**	**NA**	**1.52E-07**	**3.28E-02**
CUMULATIVE RISK		**5.95E-09**	**8.14E-03**	**1.55E-07**	**3.31E-02**	**2.43E-08**	**3.82E-02**		**1.17E-09**	**9.45E-04**	**1.47E-12**	**2.50E-03**	**1.87E-07**	**8.29E-02**

Notes:
NA: Not available
---: Risk evaluation was not performed.
HI: Hazard index
TPH: Total Petroleum Carbon
GRO: Gasoline Range Organic
DRO: Diesel Range Organic
ORO: Oil Range Organic
ug/kg: microgram per kilogram
ug/L: microgram per liter

TABLE 2-10(R)

COMPARISON OF RISK USING MAX DETECTED CONCENTRATION VS. AVERAGE CONCENTRATION FOR AREA 1: RUNWAY PROTECTION ZONE

BOEING, ST. LOUIS, MISSOURI

COCs	Soil		Groundwater		SUM OF IELCR*		SUM OF HQ*	
	Average Conc. (ug/kg)	Maximum Detected Conc. (ug/kg)	Average Conc. (ug/L)	Maximum Detected Conc. (ug/L)	Average	Maximum	Average	Maximum
1,2,3-Trimethylbenzene	---	---	1.7	3.4	NA	NA	3.33E-07	6.67E-07
1,2,4-Trimethylbenzene	---	---	1.2	1.7	NA	NA	3.50E-07	4.96E-07
Acetone	24.5	73	48.9	60.0	NA	NA	4.85E-07	1.27E-06
Benzene	32,196	258,000	6.1	34.0	3.53E-08	2.80E-07	4.33E-02	3.45E-01
Ethylbenzene	32,056	663,000	---	---	NA	NA	3.18E-04	6.58E-03
n-Propylbenzene	---	---	4.3	31.0	NA	NA	7.93E-08	5.72E-07
Toluene	195,660	3,980,000	---	---	NA	NA	2.39E-03	4.86E-02
Xylenes, Total	130,160	2,970,000	---	---	NA	NA	5.23E-04	1.19E-02
Organics Total Risk					**3.53E-08**	**2.80E-07**	**4.66E-02**	**4.12E-01**
TPH-GRO	57,836	206,000	3,416	41,410	NA	NA	1.25E-03	9.37E-03
TPH-DRO	2,487	---	353	---	NA	NA	1.95E-03	NA
TPH-ORO	16,875	117,000	1,020	19,000	NA	NA	3.07E-04	2.16E-03
TPH Total Risk					**NA**	**NA**	**3.50E-03**	**1.15E-02**
Antimony	4,005	4,350	---	---	NA	NA	4.00E-04	4.35E-04
Arsenic	19,018	44,800	47.5	51.0	1.51E-07	3.53E-07	2.34E-02	5.51E-02
Beryllium	1,155	1,370	---	---	1.10E-09	3.27E-10	8.95E-06	1.06E-05
Cobalt	9,885	11,600	---	---	9.15E-12	1.07E-11	7.78E-04	9.12E-04
Copper	14,600	16,100	---	---	NA	NA	1.46E-04	1.61E-04
Manganese	1,338,750	2,580,000	---	---	NA	NA	7.67E-03	1.48E-02
Mercury	121	490	---	---	NA	NA	2.09E-04	8.45E-04
Nickel	23,075	28,700	---	---	1.83E-12	2.28E-12	4.80E-05	5.98E-05
Selenium	1,518	2,500	---	---	NA	NA	1.33E-04	2.19E-04
Metals Total Risk					**1.52E-07**	**3.54E-07**	**3.28E-02**	**7.26E-02**
CUMULATIVE RISK					**1.87E-07**	**6.34E-07**	**8.29E-02**	**4.96E-01**

Notes:

* Includes all media, all complete pathways.

NA: Not available

-- : Ratio cannot be calculated.

---: Risk evaluation was not performed since no detect was observed in the media.

TPH: Total Petroleum Hydrocarbon

GRO: Gasoline Range Organic

DRO: Diesel Range Organic

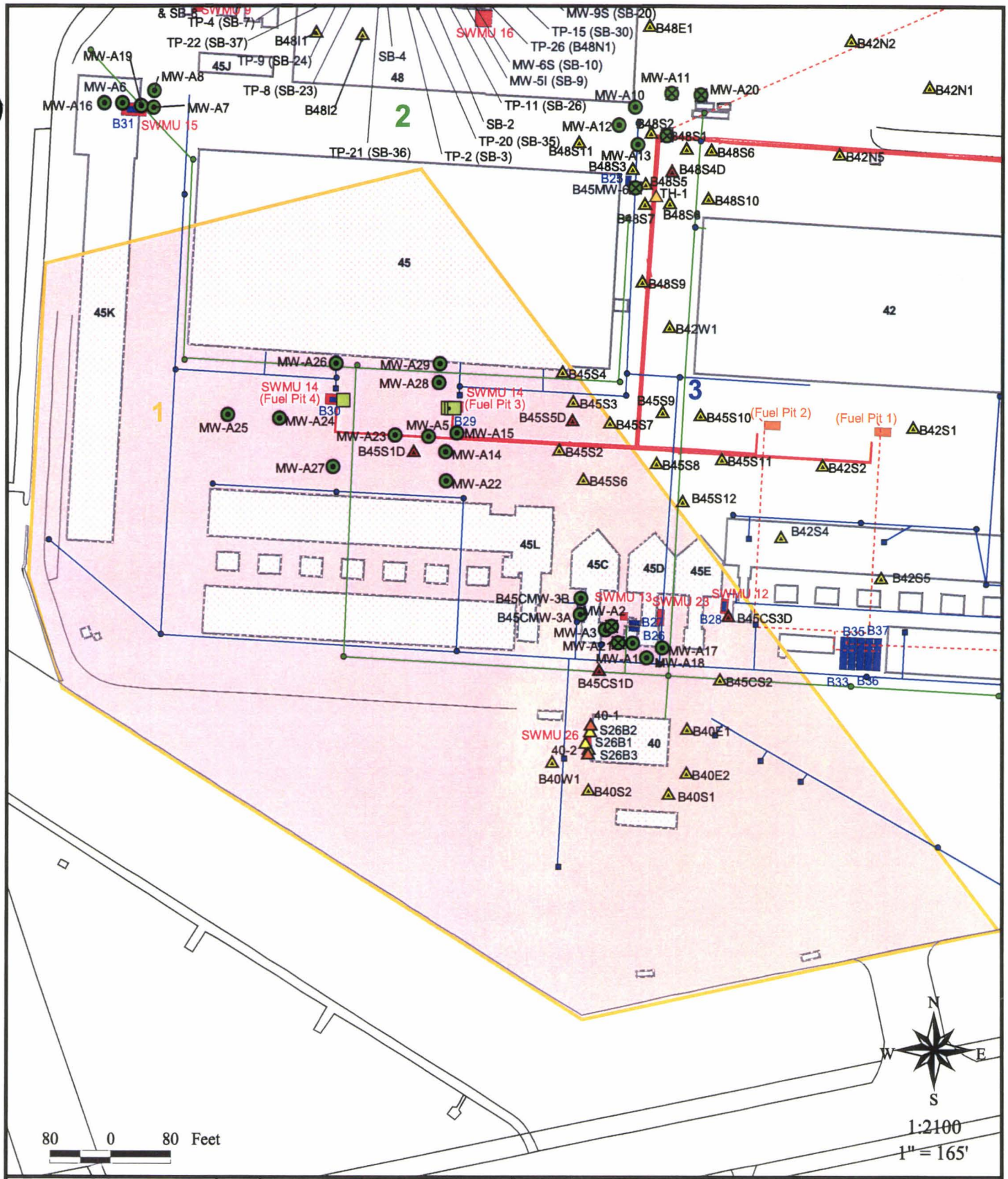
ORO: Oil Range Organic

ug/kg: microgram per kilogram

ug/L: microgram per liter

IELCR: Individual Excess Lifetime Cancer Risk

HQ: Hazard Quotient



Legend

- Other Shallow Boring
- RFI Shallow Boring
- RFI Shallow Boring/Temp. Piezometer
- RFA Boring
- Abandoned Shallow Piezometer
- Abandoned Shallow Well
- RFI Deep Boring/ Temp. Piezometer
- UST Closure Sample
- Jet Fuel Line
- Abandoned Fuel Line
- UST
- SWMU
- Other Area

Drawn by: KLC Approved by:

Checked by: Date: December 5, 2003

Risk Assessment & Management Group, Inc.

Figure 2-1
Exposure Area 1:
Runway Protection Zone,
Boeing Tract 1 South

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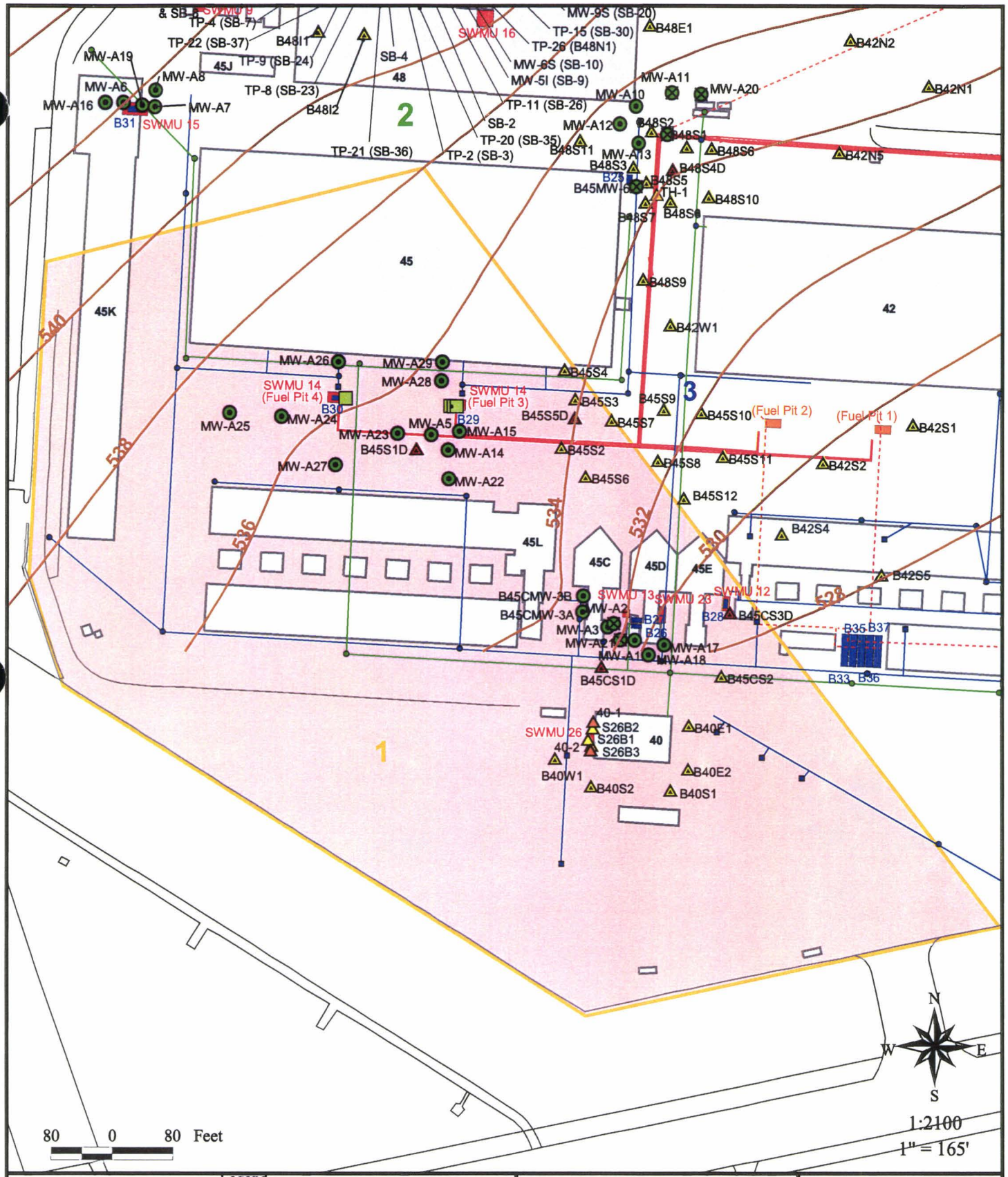

Legend

- Other Shallow Boring
- RFI Shallow Boring
- RFI Shallow Boring/Temp. Piezometer
- RFA Boring
- Abandoned Shallow Piezometer
- Abandoned Shallow Well
- RFI Deep Boring/ Temp. Piezometer
- UST Closure Sample
- Shallow Groundwater Isopleth
- Jet Fuel Line
- Abandoned Fuel Line
- UST
- SWMU
- Other Area

Drawn by: KLC Approved by:

Checked by: Date: December 5, 2003

Risk Assessment & Management Group, Inc.

Figure 2-2
Shallow Groundwater Isopleth Map for Area 1: Runway Protection Zone, Boeing Tract 1 South

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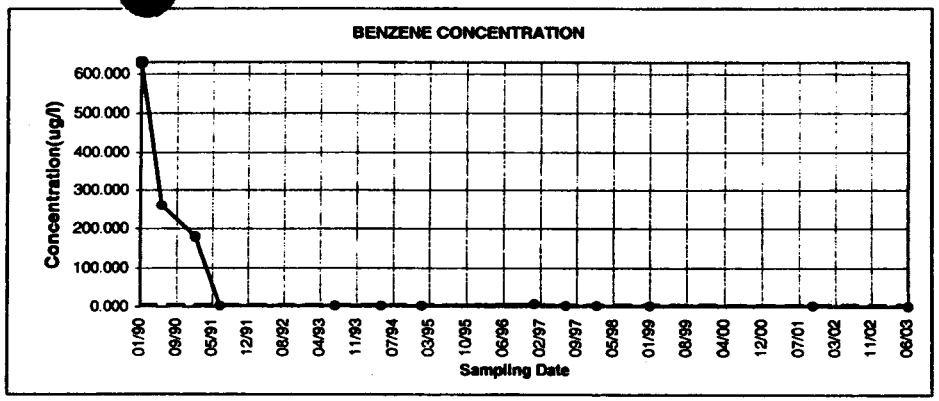
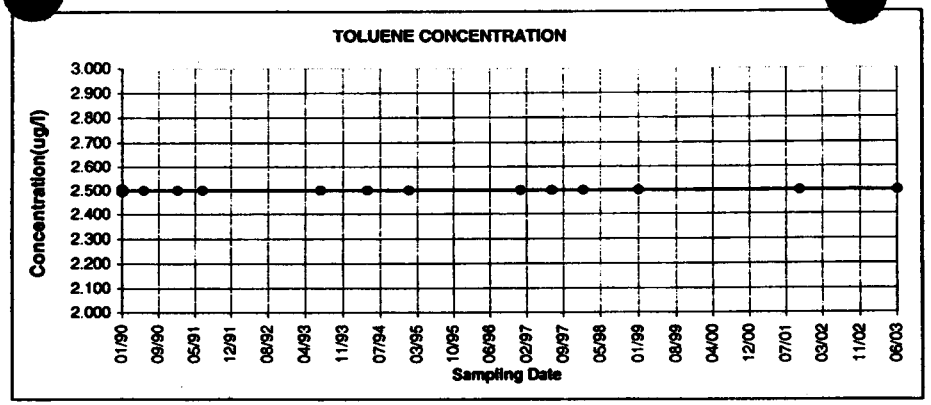
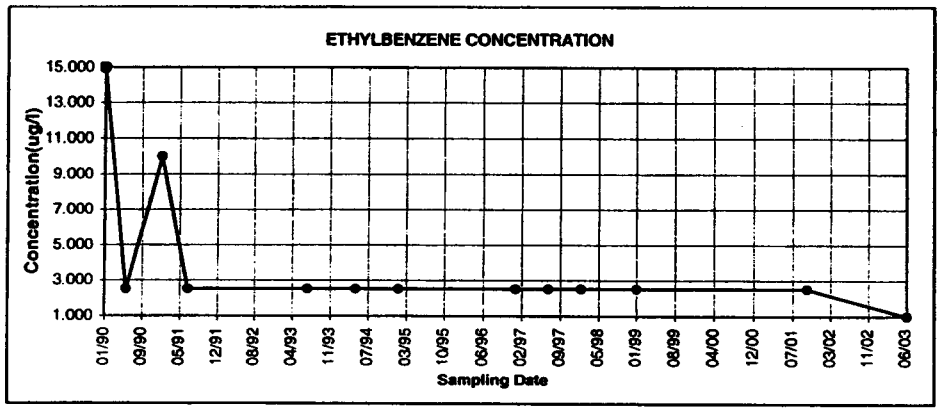
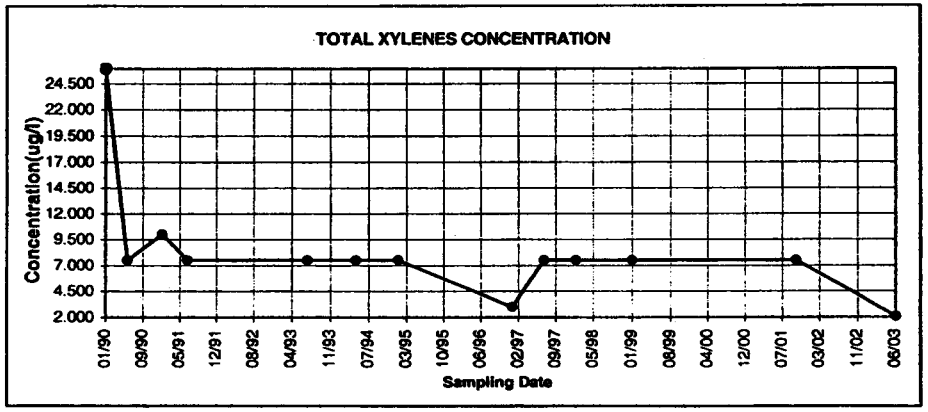
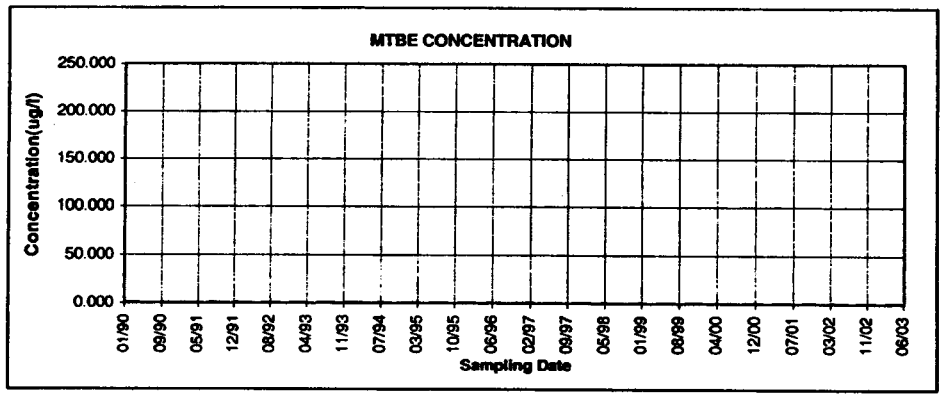
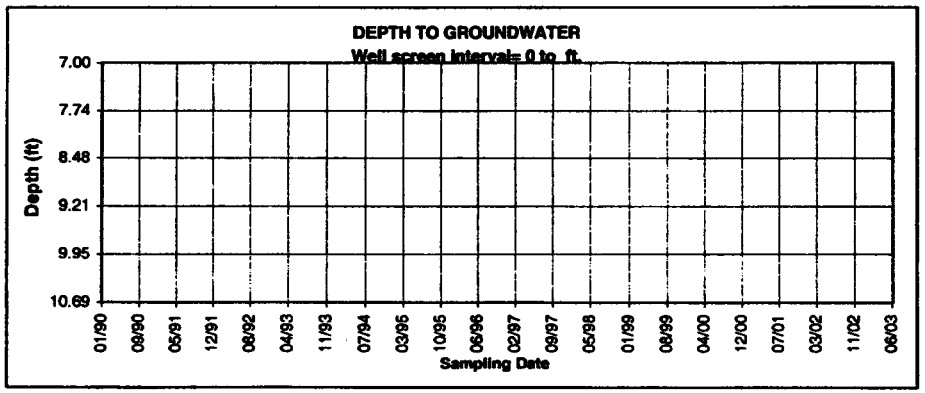












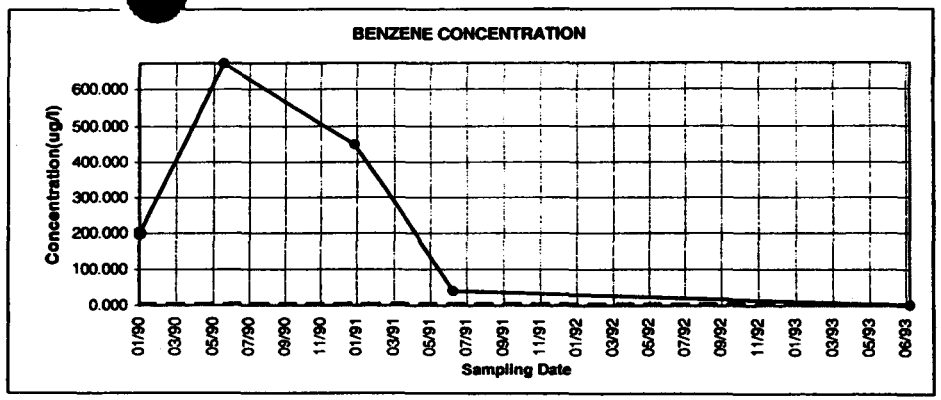
— — — — — = MCL/Groundwater standard/Average Groundwater Depth × = PSH

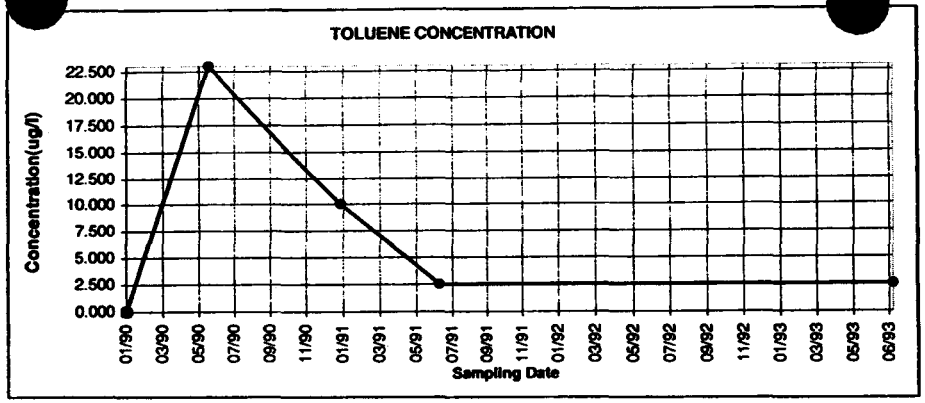
Note: PSH readings are plotted as the maximum value ever detected in the range. The point is plotted as "X" but not connected to adjacent points.

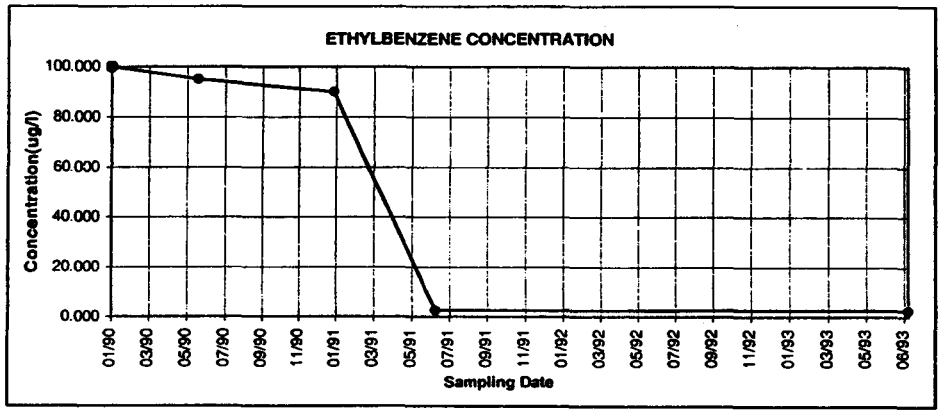
ND is assumed as zero concentration. The point is connected to the preceding and the following point by dotted line

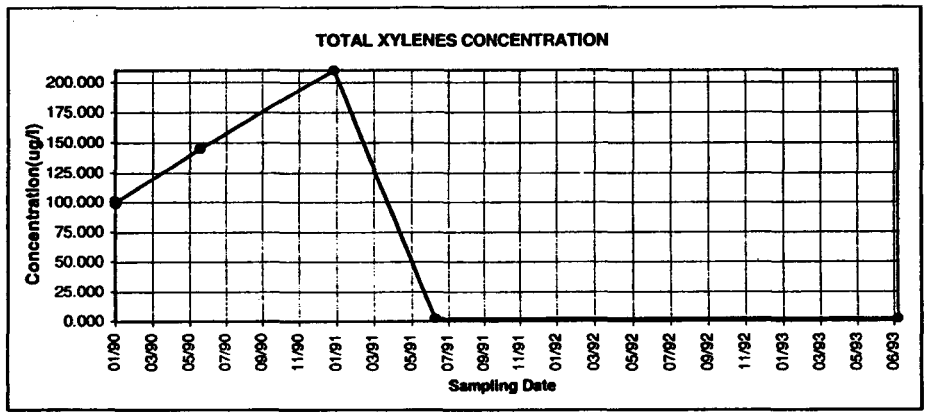
FIGURE 2-3(a)(R) GROUNDWATER DATA COLLECTED AT MW-A1

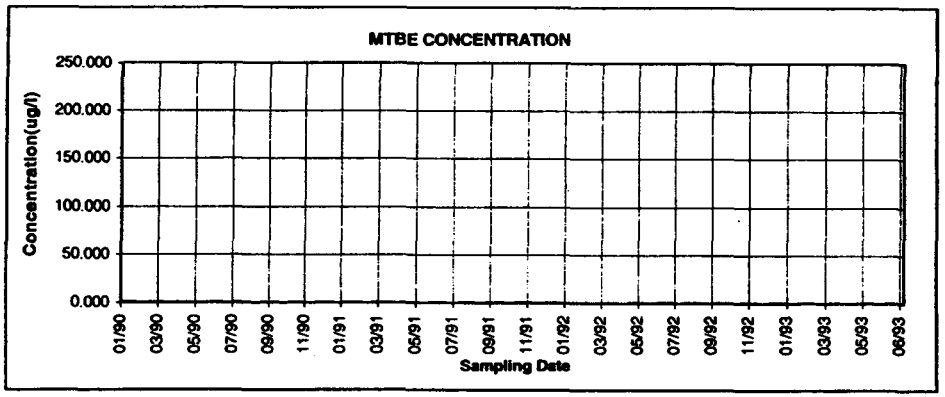
AREA 1: RUNWAY PROTECTION ZONE, BOEING TRACT 1, ST.LOUIS, MISSOURI

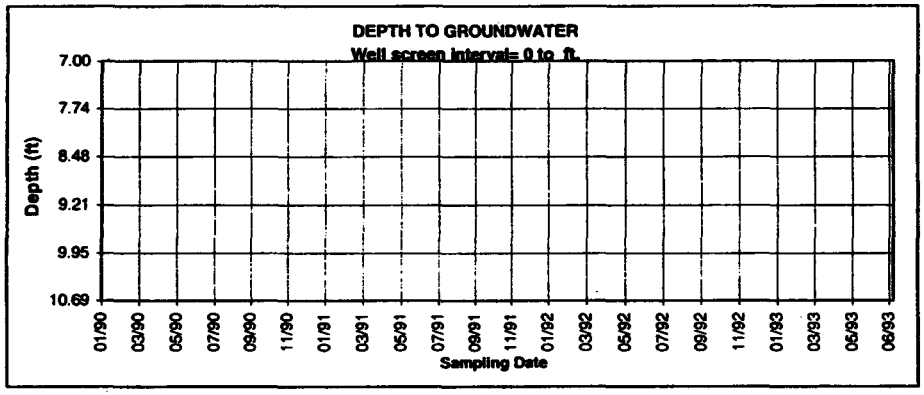












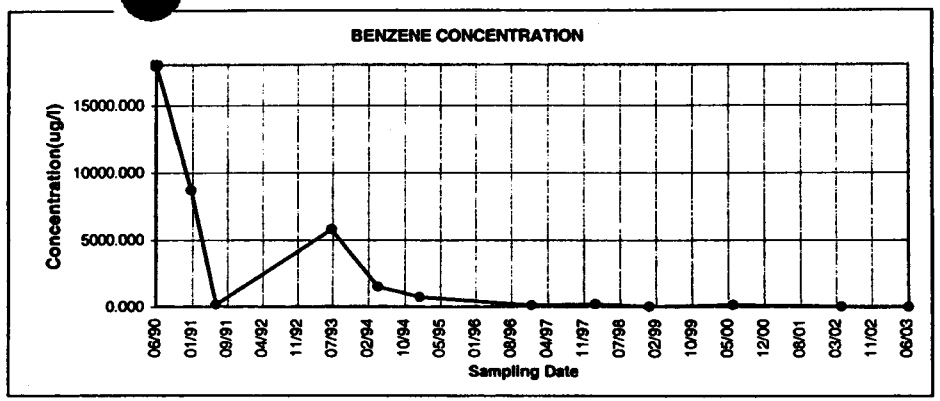
— — — — = MCL/Groundwater standard/Average Groundwater Depth × = PSH

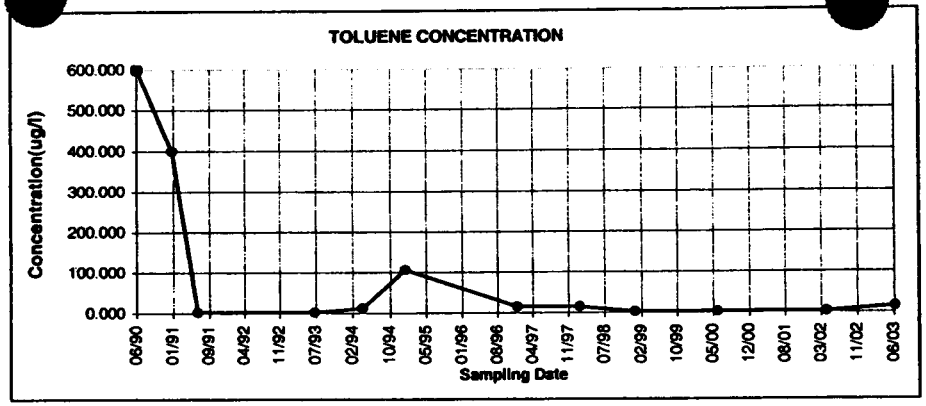
Note: PSH readings are plotted as the maximum value ever detected in the range. The point is plotted as "X" but not connected to adjacent points.

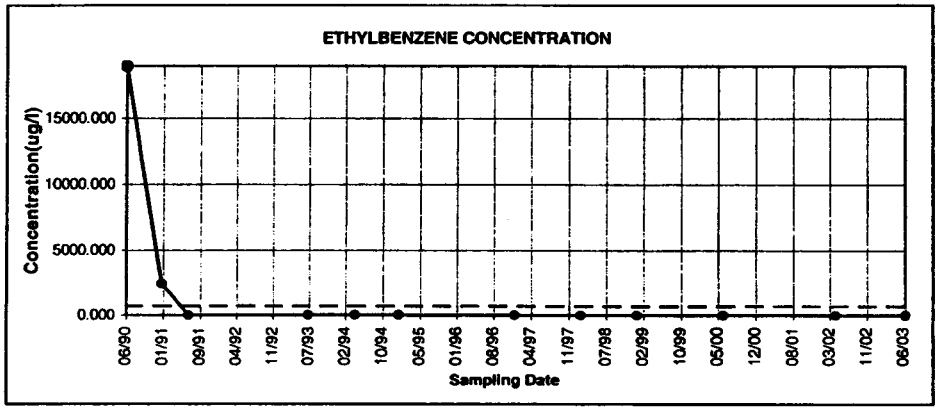
ND is assumed as zero concentration. The point is connected to the preceding and the following point by dotted line

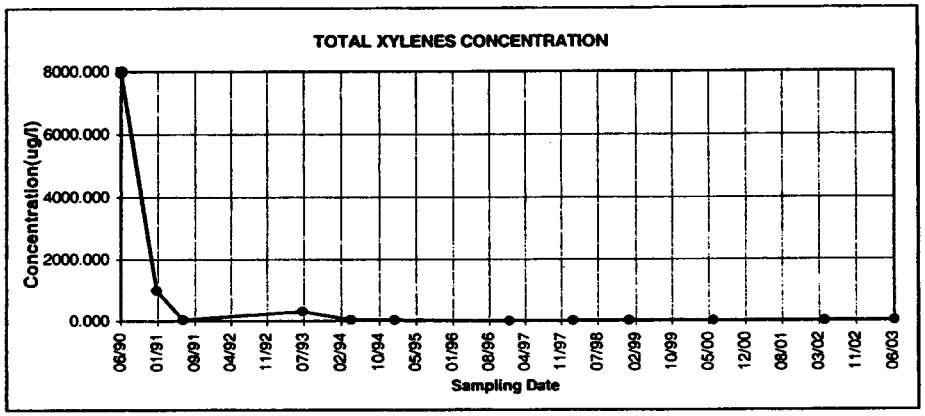
FIGURE 2-3(b) GROUNDWATER DATA COLLECTED AT MW-A2

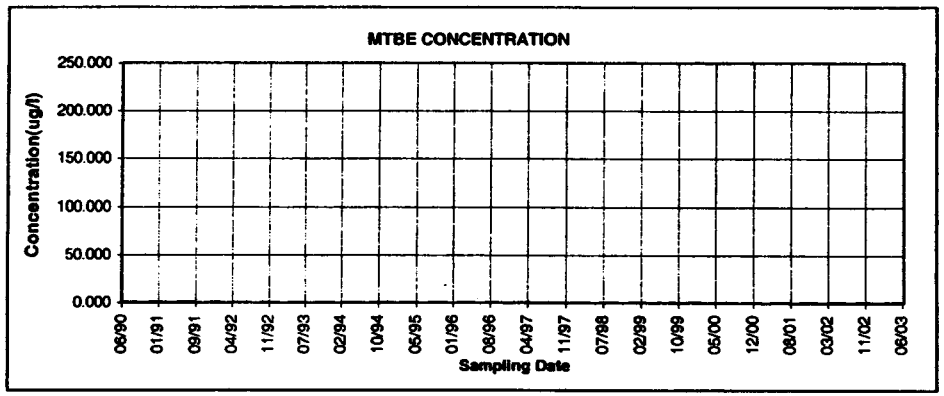
AREA 1: RUNWAY PROTECTION ZONE, BOEING TRACT 1, ST.LOUIS, MISSOURI

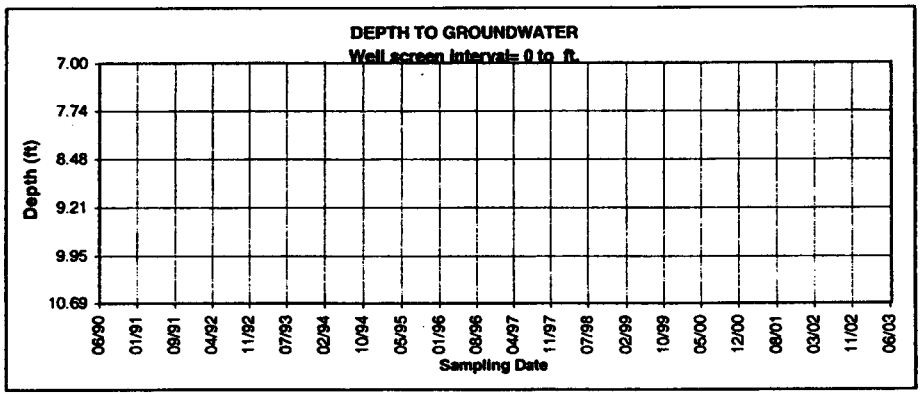












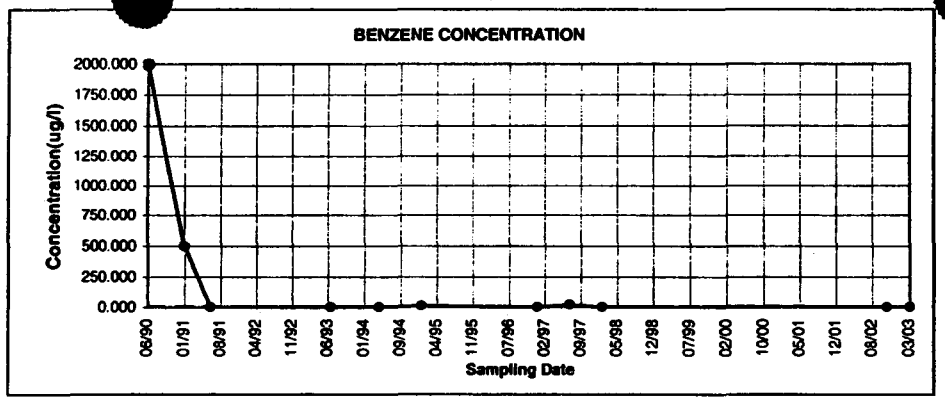
— — — — = MCL/Groundwater standard/Average Groundwater Depth × = PSH

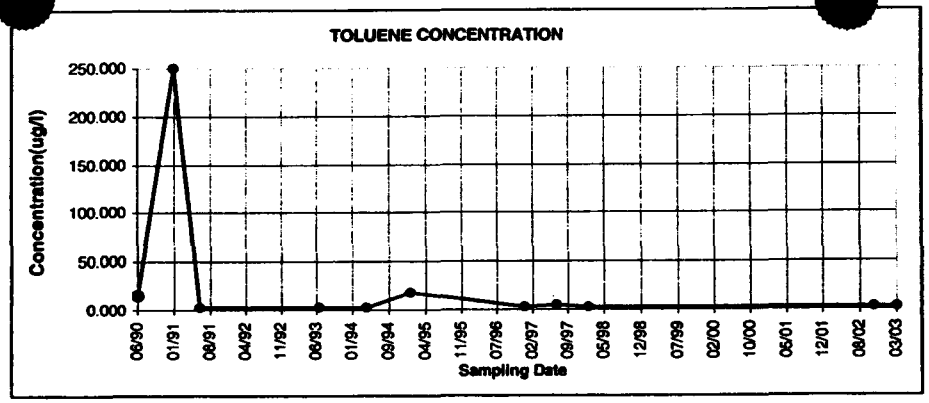
Note: PSH readings are plotted as the maximum value ever detected in the range. The point is plotted as "X" but not connected to adjacent points.

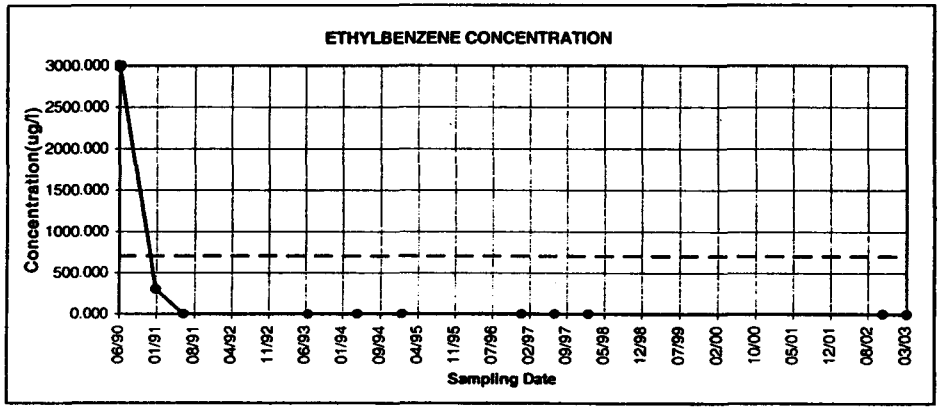
ND is assumed as zero concentration. The point is connected to the preceding and the following point by dotted line

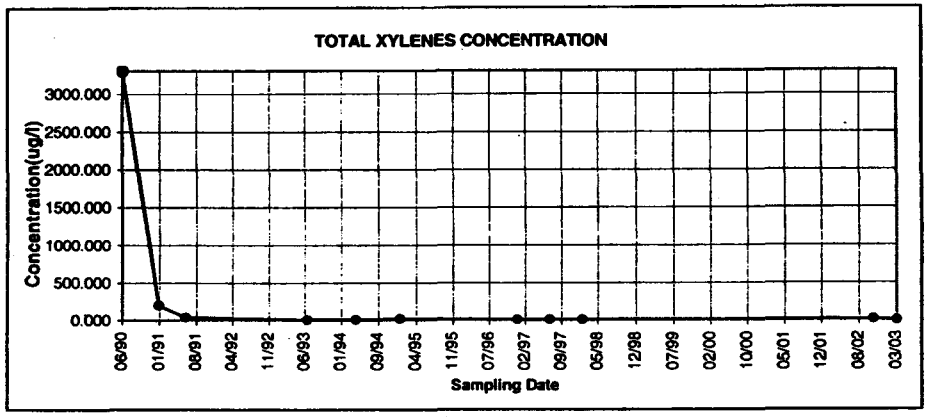
FIGURE 2-3(c)(R) GROUNDWATER DATA COLLECTED AT MW-A15

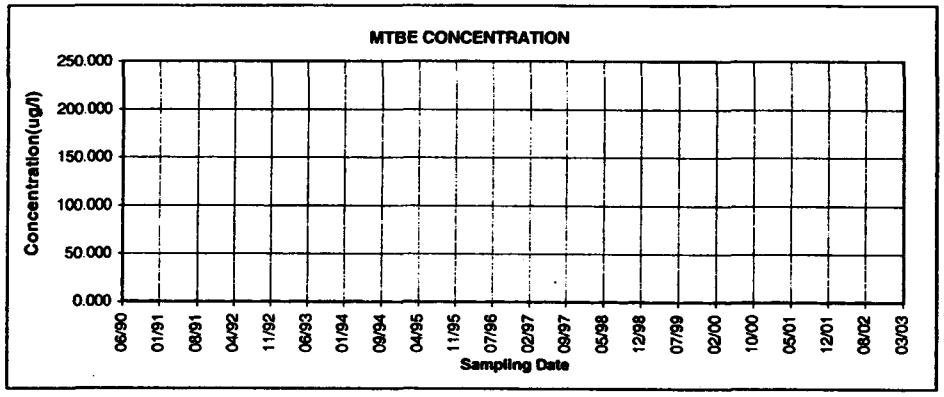
AREA 1: RUNWAY PROTECTION ZONE, BOEING TRACT 1, ST.LOUIS, MISSOURI

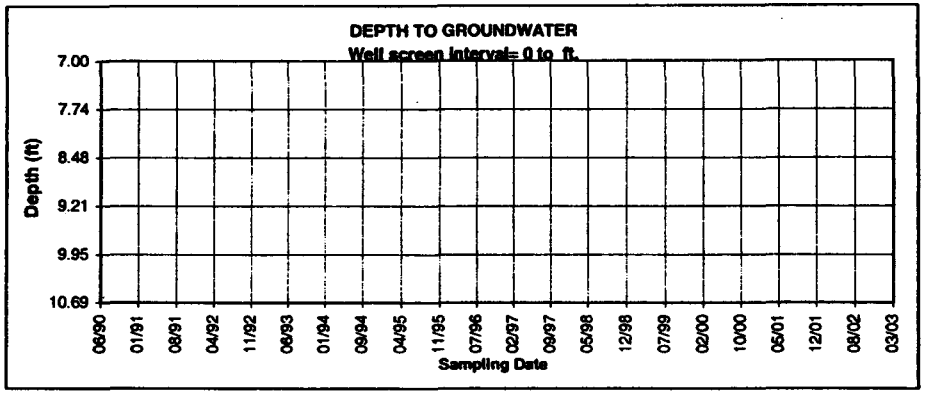












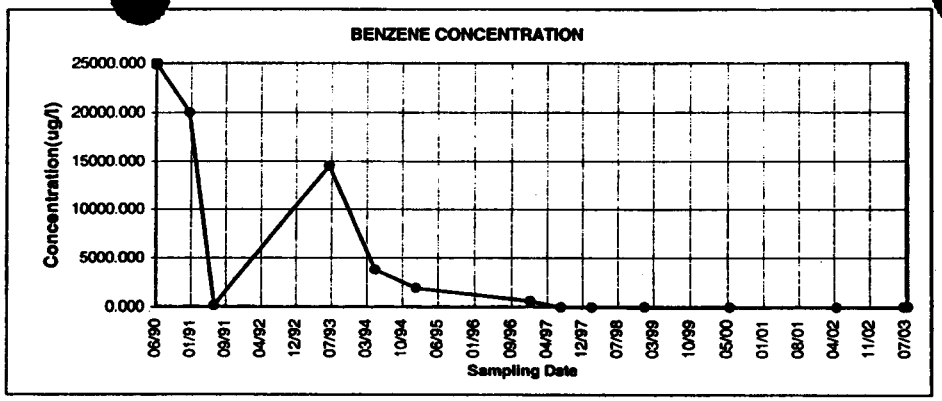
— — — — = MCL/Groundwater standard/Average Groundwater Depth × = PSH

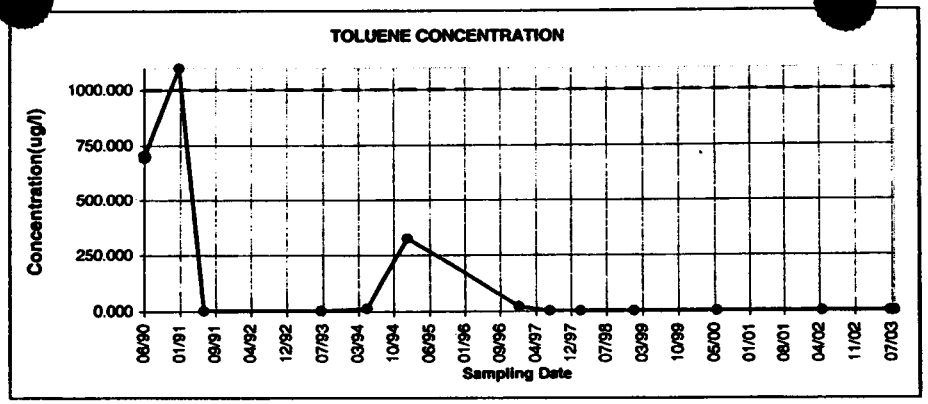
Note: PSH readings are plotted as the maximum value ever detected in the range. The point is plotted as "X" but not connected to adjacent points.

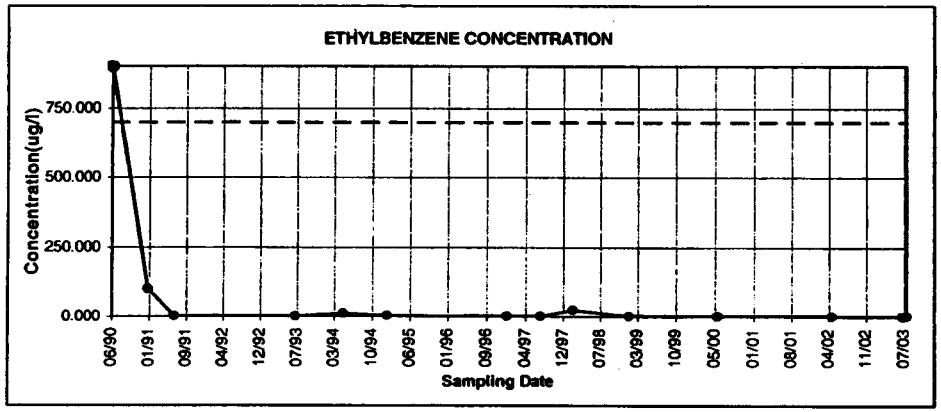
ND is assumed as zero concentration. The point is connected to the preceding and the following point by dotted line

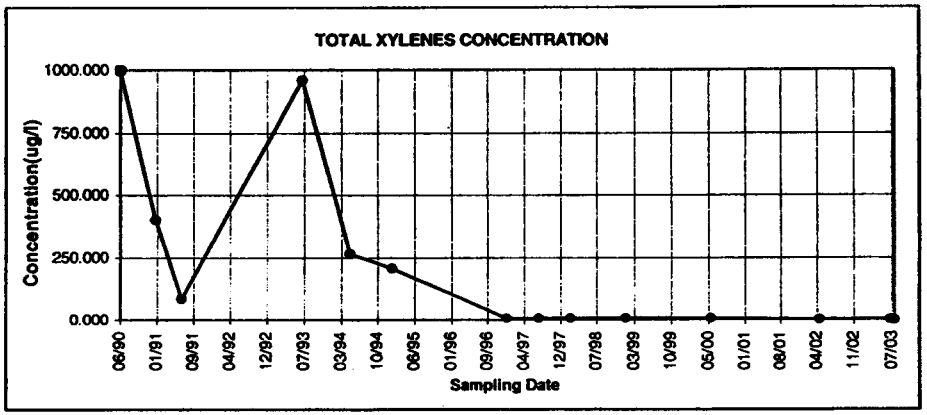
FIGURE 2-3(d)(R) GROUNDWATER DATA COLLECTED AT MW-A22

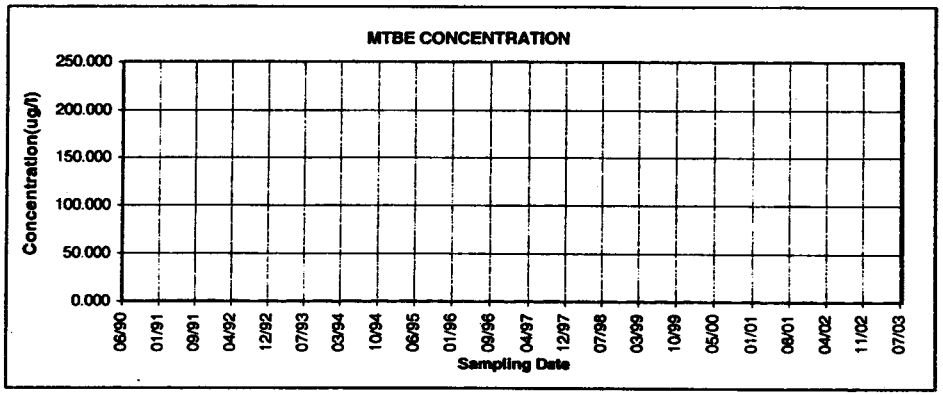
AREA 1: RUNWAY PROTECTION ZONE, BOEING TRACT 1, ST.LOUIS, MISSOURI

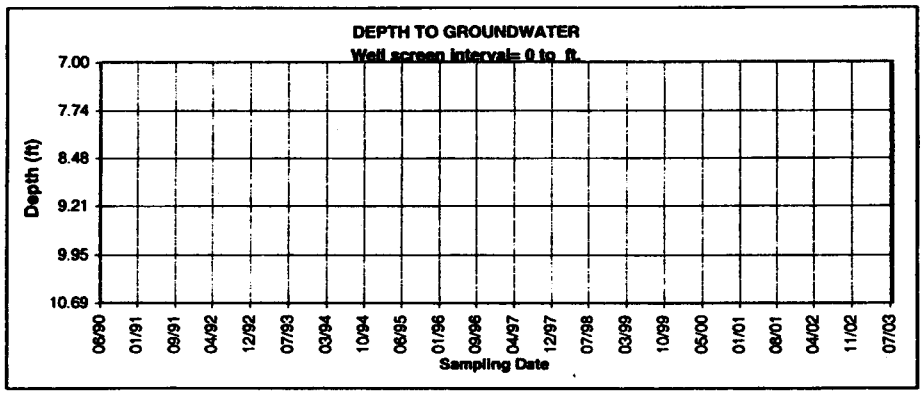












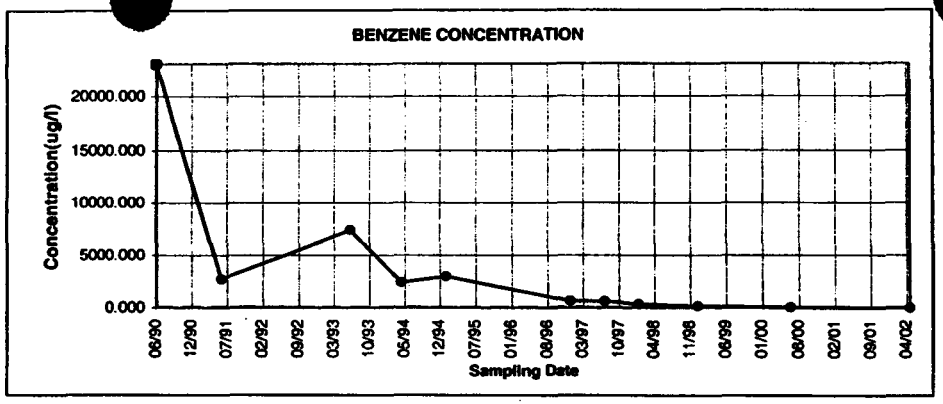
— — — — = MCL/Groundwater standard/Average Groundwater Depth × = PSH

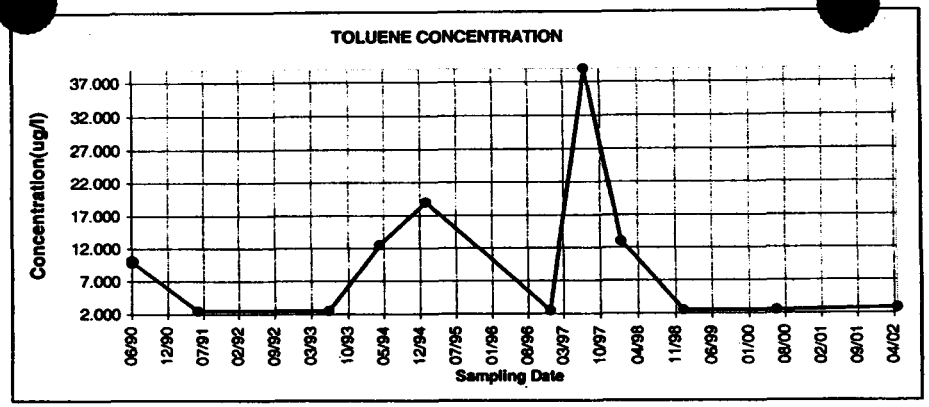
Note: PSH readings are plotted as the maximum value ever detected in the range. The point is plotted as "X" but not connected to adjacent points.

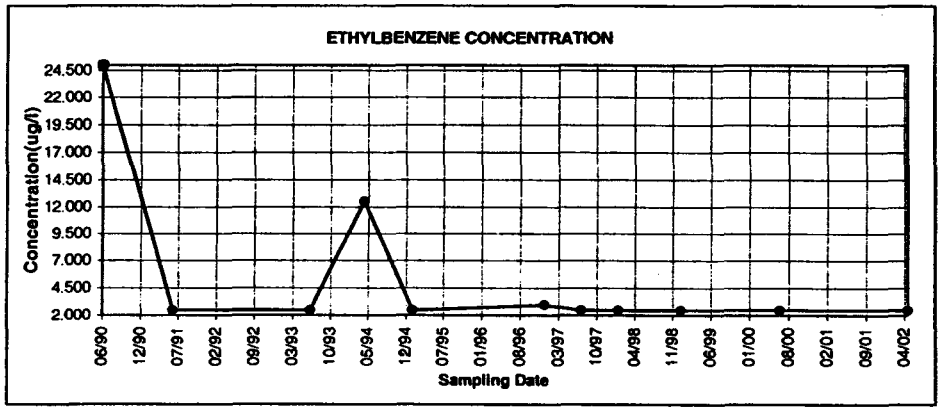
ND is assumed as zero concentration. The point is connected to the preceding and the following point by dotted line

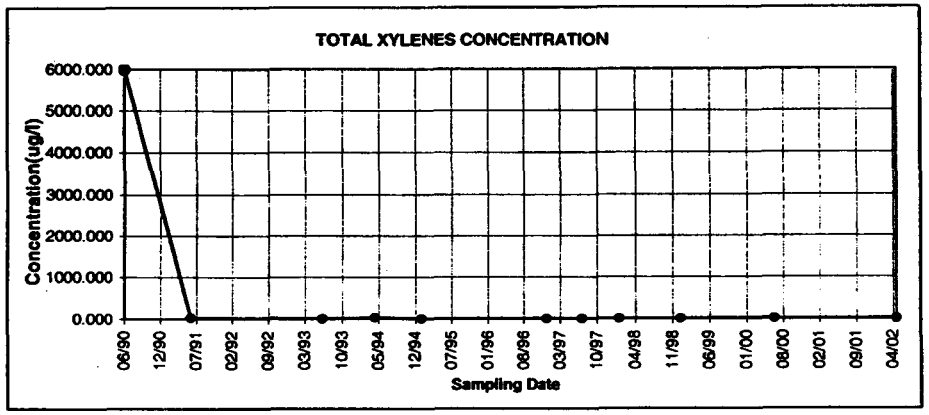
FIGURE 2-3(e)(R) GROUNDWATER DATA COLLECTED AT MW-A23

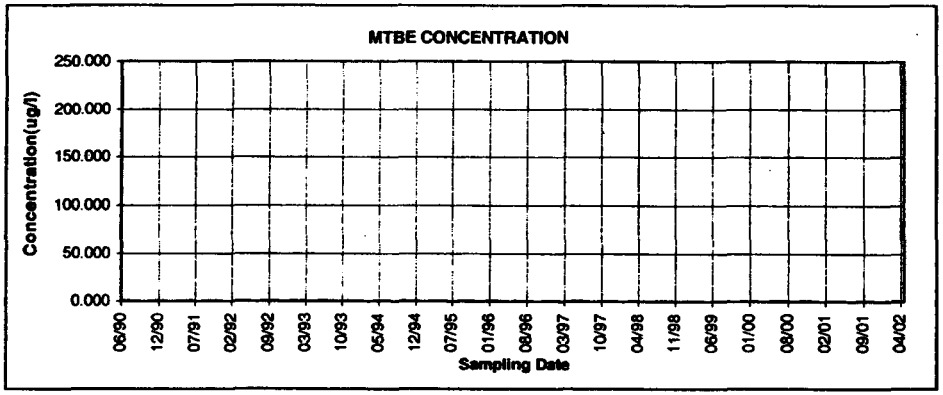
AREA 1: RUNWAY PROTECTION ZONE, BOEING TRACT 1, ST.LOUIS, MISSOURI

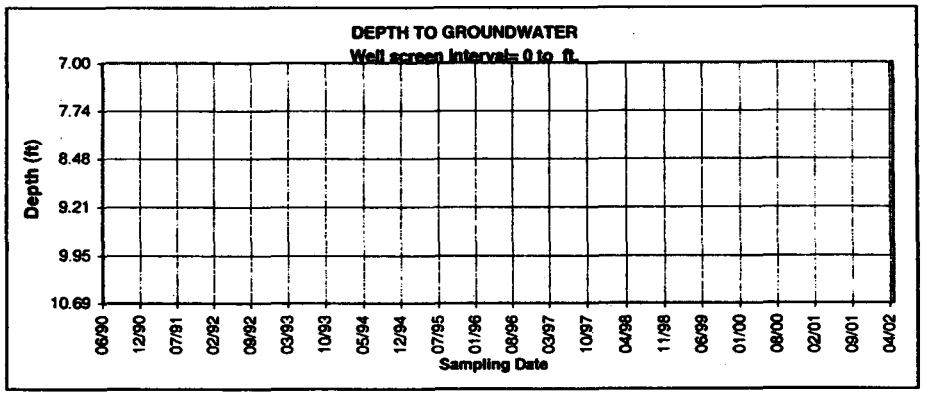












— — — — — = MCL/Groundwater standard/Average Groundwater Depth × = PSH

Note: PSH readings are plotted as the maximum value ever detected in the range. The point is plotted as "X" but not connected to adjacent points.

ND is assumed as zero concentration. The point is connected to the preceding and the following point by dotted line

FIGURE 2-3(f)(R) GROUNDWATER DATA COLLECTED AT MW-A28

AREA 1: RUNWAY PROTECTION ZONE, BOEING TRACT 1, ST.LOUIS, MISSOURI

ATTACHMENT 2-A(R)

ECOLOGICAL RISK ASSESSMENT – AREA 1 RUNWAY PROTECTION ZONE TIER 1 SCREENING CHECKLIST FOR POTENTIAL RECEPTORS AND HABITAT CHECKLIST #1

1. Is the site less than ½ mile to a surface water resource (pond, river, lake, etc.)?

   Area 1 (at its closest point) is about 2,700 ft from Coldwater Creek, therefore it is not within ½ mile of a surface water resource.

2. Are wetlands (e.g. marshes, swamps, fens) on or adjacent to the site?

   No.

3. Are contaminated soils uncovered or otherwise accessible to ecological receptors and the elements?

   No, the area is entirely paved.

4. Has a process (operational) discharge or storm water permit not been issued for the site?

   Yes, site-wide, there is a storm water permit.

5. Is the site located in a known Karst environment (see Reference map)?

   No.

6. Are there federal or state rare, threatened, or endangered species on or within a ½ mile radius of the site? Note, the ½ mile radius limit does not necessarily apply to situations where a hydrogeological connection exists between the site and karsitic features.

   No.

7. Are there one or more environmentally sensitive areas (see Ecological Risk Assessment Figure #1 for definition) at or within a ½ mile radius of the site?

   No.

8. Are commercially or recreationally important species (fauna or flora) on or within a ½ mile radius of the site?

   No.

ATTACHMENT 2-B(R)

ECOLOGICAL RISK ASSESSMENT – AREA 1 RUNWAY PROTECTION ZONE TIER 1 SCREENING CHECKLIST FOR POTENTIAL RECEPTORS AND HABITAT CHECKLIST #2

1a. Can contaminants associated with the site leach, dissolve, or otherwise migrate to groundwater?

Yes, shallow groundwater impact has been observed within this Area.

1b. Are contaminants associated with the site mobile in groundwater?

Yes, some migration of impacted groundwater has occurred, but impact is delineated within the boundaries of the Area.

1c. Does groundwater from the site discharge into ecological receptor habitat?

Yes, ultimately into Coldwater Creek.

1. Could contaminants associated with the site reach ecological receptors via groundwater?

No, although groundwater impact has been observed, it is delineated within the boundaries of the specific Area, and Coldwater Creek is located about 2,700 feet to the northeast of Area 1.

2a. Is NAPL present at the site?

Yes, it is measureable in one monitoring well (0.04 foot thick in 3/2004), and a sheen in two other monitoring wells..

2b. Is NAPL migrating?

No.

2c. Could NAPL discharge occur where ecological receptors are found?

No, the closest ecological receptor is Coldwater Creek located about 2,700 feet from the Area.

2. Could contaminants from the site reach ecological receptors via migration of NAPL?

No.

3a. Are contaminants present in surface soils?

No.

3b. Can contaminants be leached from or be transported by erosion of surface soils?

No, the site is paved.

3. Could contaminants reach ecological receptors via erosional transport of contaminated soil or via precipitation runoff?

No, the site is paved, thereby limiting any possible contact. Also, surficial soil is not impacted within this Area.

4a. Are contaminants present in surface soil or on the surface of the ground?

No chemicals are on the surface. COCs in surficial soil if present are not of concern for ecological receptors since the area is paved and likely to stay so.

4b. Are potential ecological receptors on the site?

No, the site is paved, and located within a commercial area.

4. Could contaminants reach ecological receptors via direct contact?

No.

5a. Are contaminants present on the site volatile?

Yes.

5b. Could contaminants on the site be transported in air as dust or particulate matter?

No, the site is paved.

5. Could contaminants reach ecological receptors via inhalation of volatilized contaminants or contaminants adhered to dust in ambient air or in subsurface burrows?

No, the site is paved.

6a. Are contaminants present in surface and shallow subsurface soils or on the surface of the ground?

Yes, in shallow subsurface soils.

6b. Are contaminants found in soil on the site taken up by plants growing on the site?

No, the site is paved.

6c. Do potential ecological receptors on or near the site feed on plants found on the site?

No, the site is paved.

6d. Do contaminants found on the site bioaccumulate?

Some metals may bioaccumulate but since ecological receptors are not likely to come in contact with soil, the bioaccumulation is unlikely.

6. Could contaminants reach ecological receptors via ingestion of either soil, plants, animals, or contaminants directly?

No.

7a. Are there Karsitic features on or within a ½ mile radius of the site?

No.

7b. Is there a hydrogeological connection between the site and karsitic features such as seeps, springs, streams, or other surface water bodies?

No.

7. Could contaminants reach ecological receptors via transport through a Karst system?

No.

Section
3.0

3.1 INTRODUCTION

The Demolished Area is located in the southern portion of the Facility, adjacent to and south of the Norfolk and Western Railroad Company railroad tracks and Banshee Road (see Figure 3-1). This section describes the constituents found in this Area, the exposure model, the evaluation of the current and future risk to human health and the environment, and conclusions based on the results of the risk evaluation.

3.2 DESCRIPTION OF AREA

The Demolished Area is approximately 900 feet long by 750 feet wide. Within this Area are six buildings (four of which have been demolished), portions of two buildings, and a parking lot. The Area is currently paved. Under future construction plans, the remaining buildings are due to be demolished; however, it is not known whether new buildings will be constructed in the Area. It is anticipated that whatever the future building arrangements, the remainder of the Area will continue to be paved. For the purposes of this risk evaluation, Area 2 was further subdivided into three Sub-areas; 2A, 2B, and 2C (see Figure 3-1), to (i) reduce the size of the exposure units evaluated, and (ii) to evaluate the risk from specific sources. A brief description of the Sub-areas follows:

- Sub-area 2A: This is the smallest of the three Sub-areas consisting of the western portion of Area 2 and covers an area of 3.03 acres. The primary chemicals that exceeded screening criteria in this Sub-area were VOCs, TPH, and metals.

- Sub-area 2B: This is the largest of the three Sub-areas consisting of the middle portion of Area 2 including SWMU 17 and covers an area of 4.48 acres. The primary chemicals that exceeded screening criteria in this Sub-area were VOCs, TPH, and metals.

- Sub-area 2C: This is the intermediate sized Sub-area consisting of the eastern/southeastern portion of Area 2 and covers an area of 3.88 acres. The primary chemicals that exceeded screening criteria in this Sub-area were VOCs and TPH.

3.2.1 Potential Sources within Area

The following SWMU's (see Figure 3-1) were identified in the Sub-areas during the RFA investigation (SAIC, 1995):

Sub-area 2A

- SWMU 9: Six 750-gallon waste nitric acid and hydrofluoric acid ASTs (H1, H2, H3, H4, H5, and H6);
- SWMU 15: One 4,380 gallon waste jet fuel UST (B31); and
- SWMU 27: Storage area for ten 55-gallon drums, containing waste hydrofluoric and nitric acid plastic scrubber saddles.

Additionally, Airport Terminal Services, Inc. had a tank farm located on Airport property at 5310 Banshee Road immediately west (upgradient) of Sub-area 2A, which contained 14 gasoline USTs with capacities of 1,000 gallons to 20,000 gallons. The tank farm has been closed and the USTs removed.

Sub-area 2B

- SWMU 1: Two 10,000-gallon waste sodium hydroxide aboveground storage tanks (ASTs) (H19 & H20);
- SWMU 2: Three 850-gallon waste nitric acid and hydrofluoric acid ASTs (H12, H13, & H14);
- SWMU 16: MEK and MIBK recycling/recovery unit;
- SWMU 17: PCE recovery unit; and
- SWMU 25: Less-than-90 Day Storage area for up to twenty-eight 55-gallon drums of waste solvents, paints, and oils.

Additionally, there were two 15,000-gallon fuel oil ASTs formerly located in Sub-area 2B just west of Building 48A and north of Building 48, which had distribution lines running east-west along the south side of the former Building 51 and into the former Building 53 (MACTEC, 2004).

Sub-area 2C

There are no SWMUs in Sub-area 2C. However, a petroleum pipeline (carrying jet fuels JP-5 and JP-8) traversed Sub-area 2C to the east of Building 45 and is connected to a tank farm near Building 41 located to the east (outside of Area 2).

USTs

Three USTs (see Table 3-1) have been identified within this Area, ranging in size from 335 gallons to 6,000 gallons. The contents of the USTs were diesel, solvents, and waste jet fuel. Two of the USTs are located in Sub-area 2A and one in Sub-area 2C.

Two jet fuel pipelines were located outside of the Area 2 along the north side of Banshee Road.

Hence, within Area 2 we anticipate the impact to be primarily petroleum hydrocarbons and VOCs.

3.2.2 Soil Stratigraphy within Area

One hundred soil borings have been advanced in Area 2 (see Table 3-2 for additional information). Based on the soil boring logs, the soil stratigraphy within this Area is silty clay from approximately 0.5 feet bgs to 20 feet bgs, below which is clay. For additional details, refer to MACTEC, 2004. Bedrock is found in this Area at approximately 75 feet bgs, which consists of a low permeability shale. No karst features have been identified in this Area. For the calculation of risk to indoor inhalation, a soil source average depth for each of the Sub-areas was used as noted below (See Table 1-9):

- Sub-area 2A: 4.3 feet (131 cm)
- Sub-area 2B: 5.6 feet (171 cm)

- Sub-area 2C: 5.1 feet (155 cm)

Since the calculated average depth to soil source was deeper than the average groundwater depth for Sub-area 2C, the average depth to groundwater (5.1 feet) was conservatively used as the average depth of soil source.

3.2.3 Hydrogeology within Area

Based on recent (since 2000) groundwater gauging data, groundwater flow within the shallow zone is to the southeast (see Figure 3-2), towards Area 3, the airport runway, and eventually Coldwater Creek located 2,500 feet (at its closest point) from the Area. The depth to shallow groundwater in this Area ranges from 4 to 9 feet bgs. To evaluate risk to indoor inhalation, an average depth to groundwater for each of the Sub-areas was used as noted below (see Table 1-13):

- Sub-area 2A: 6.6 feet (201 cm)
- Sub-area 2B: 6.6 feet (201 cm)
- Sub-area 2C: 5.1 feet (155 cm)

Since no monitoring wells were monitored for groundwater depths in Sub-area 2A, the average depth to groundwater in the adjacent Sub-area 2B was used. One deep monitoring well (MW-11D) is located within Sub-area 2B and screened from 64 – 74 feet bgs. The stabilized groundwater depth in the deep well (MW-11D) is consistently between 21 and 24 feet bgs.

3.3 LAND USE

3.3.1 Current Land Use

The Area is owned by the St. Louis Airport Authority and is currently leased by Boeing. It is being used as an industrial facility. However, Boeing intends to vacate the Area during 2005, at which point the remaining buildings may be demolished.

3.3.2 Future Land Use

In the future, it is anticipated that as part of the St. Louis Airport redevelopment plans, the current buildings located within the Area will be demolished; however, it is not known whether a building will be constructed in the Area in the future (personal communication, St. Louis Airport). Hence, conservatively we have anticipated that a building will be constructed, and that it will encompass the impacted areas of the site (i.e., those areas where soil and groundwater concentration information is available). This new building will be a non-residential structure without a basement.

3.4 AVAILABLE DATA

The following gives an overview of the available data within the Area:

- Twenty-two monitoring wells are located within this Area of which 13 are active (none of 5 in Sub-area 2A, 11 of 11 in Sub-area 2B, and 2 of 6 in Sub-area 2C) (see Table 3-3 for monitoring well information).

- Recent groundwater sampling (since 1998) has been completed at 12 wells (none in Sub-area 2A, 11 in Sub-area 2B, and 1 in Sub-area 2C).

- Forty-eight soil borings completed as piezometers exist within this Area, and have been sampled at least once for groundwater since 1998 (5 in Sub-area 2A, 32 in Sub-area 2B, and 11 in Sub-area 2C).

- Five temporary piezometers were installed during 2004 to obtain groundwater samples for speciation and fractionation of total petroleum hydrocarbons (TPH) (1 in Sub-area 2A, 4 in Sub-area 2B, and none in Sub-area 2C).

- A total of 119 soil samples have been collected within this Area from 78 soil borings since 1988 (32 samples from 15 borings in Sub-area 2A, 76 samples from 52 borings in Sub-area 2B, and 11 samples from 11 borings in Sub-area 2C) (see Appendix C-1).

3.5 CONSTITUENTS IDENTIFIED WITHIN AREA

3.5.1 Soil

Soil samples were analyzed during the various investigations conducted within the Area for a comprehensive list of constituents that included VOCs, TPH, and metals. Laboratory methods that were used include SW 846 Methods 3546/DRO, 6010, 7060, 7421, 7471, 7740, 8015, 8021, 8240, 8260, OA1, and OA2. Appendix C-1 includes a comprehensive table of the soil sample results for those constituents detected at least once. PCBs and SVOCs including PAHs were analyzed in pre-1998 samples from this Area but all were found to be non-detect. These data are not included in Appendix C-1. This is generally consistent with the identified potential sources within the Area; and therefore, PCBs and SVOCs will not be quantitatively evaluated.

The following 50 constituents were detected in at least one soil sample from depths less than or equal to 20 feet bgs.

TOTAL METALS/INORGANICS		VOCs/TPH	
Aluminum	Lead	1,1-Dichloroethene	Naphthalene
Antimony	Magnesium	1,2-Dichloroethene (total)	n-Butylbenzene
Arsenic	Manganese	1,2,4-Trimethylbenzene	n-Propylbenzene
Barium	Mercury	Acetone	o-Xylene
Beryllium	Nickel	Benzene	p-Isopropyltoluene
Cadmium	Potassium	cis-1,2-Dichloroethene	sec-Butylbenzene
Calcium	Selenium	Chloroethane	Tetrachloroethene
Chromium	Silver	Dichlorodifluoromethane	Toluene
Cobalt	Sodium	Ethylbenzene	trans-1,2-Dichloroethene
Copper	Thallium	Isopropyl benzene	Trichloroethene
Fluoride	Vanadium	m,p-Xylene	Xylenes, total
Iron	Zinc	Methyl ethyl ketone	Vinyl chloride
		Methylene chloride	TPH (21 types)

Data for these constituents are presented in Appendix C-1 and were segregated into data for each Sub-area. This segregated data was used to (i) identify the chemicals to be included in the risk assessment, and (ii) calculate the representative concentrations. The specific steps are discussed below:

Step1: The Area 2 soil data was segregated into three parts for Sub-areas 2A, 2B, and 2C.

Step 2: The data for each Sub-area was divided into data applicable for estimating exposure to the non-residential worker and the construction worker. For the non-residential worker, soil data above the average depth of water table was used since concentrations below the water table would not contribute to indoor inhalation. The depth to groundwater was estimated as the average of the four quarterly measurement events between December 2003 and June 2003. See Table 1-13 for depth to groundwater for the monitoring wells measured in these Sub-areas. For construction worker, data up to 20 ft bgs (assumed depth of construction) was used. Table 3-4 presents a listing of the soil samples used in the risk calculations.

Step 3: The maximum detected concentrations of metals were compared with the background levels. Metals whose maximum detected concentrations did not exceed the background levels were eliminated from further consideration.

Note as discussed in Sections 1.9.11 and 1.9.12, lead and 1,2-dichloroethene (total) were also eliminated. Calcium and iron were not considered since they are ubiquitous in nature and have no known sources in this Area. Magnesium and fluoride were not considered because toxicity and physical/chemical values were not available.

The result of applying the above steps to the three Sub-areas and two receptors is discussed below. Tables 3A-5(a) – (c), 3B-5(a) – (c), and 3C-5(a) – (c) present the soil constituents average concentrations.

3.5.1.1 Sub-area 2A

Non-residential Worker

Tables 3A-5(a) – (c) for the non-residential worker presents the data for constituents in soil samples collected at or above a depth of 6.6 feet bgs (average depth of groundwater table).

Metals whose maximum detected concentrations did not exceed the background levels were eliminated from further consideration and include aluminum, barium, chromium, manganese, potassium, sodium, and vanadium (see Table 3A-5(c)).

Based on this evaluation, the following 17 constituents were considered for quantitative risk evaluation for soil exposures to the non-residential worker, and are presented in Tables 3A-5(a) – (c):

TOTAL METALS/INORGANICS		VOCs/TPH	
Antimony	Copper	Benzene	Methylene Chloride
Arsenic	Mercury	Dichlorodifluoromethane	Tetrachloroethene
Beryllium	Nickel	Ethylbenzene	Toluene
Cadmium	Zinc	Xylenes, total	TPH (16 types)
Cobalt			

Construction Worker

Tables 3A-5(a) – (c) for the construction worker presents the data for constituents in soil samples collected above the typical construction depth. To be conservative, soil samples collected at or above a depth of 20 feet bgs in this Area are included in Tables 3A-5(a) – (c).

Metals whose maximum detected concentrations did not exceed the background levels were eliminated from further consideration and include aluminum, barium, chromium, manganese, potassium, sodium, and vanadium (see Table 3A-5(c)).

Based on this evaluation, the following 18 constituents were considered for quantitative risk evaluation for soil exposures to the construction worker, and are presented in Tables 3A-5(a) – (c):

TOTAL METALS/INORGANICS		VOCs/TPH	
Antimony	Cobalt	Benzene	Tetrachloroethene
Arsenic	Copper	Dichlorodifluoromethane	Toluene
Beryllium	Mercury	Ethylbenzene	Trichloroethene
Cadmium	Nickel	Methylene chloride	TPH (16 types)
	Zinc	Xylenes, total	

3.5.1.2 Sub-area 2B

Non-residential Worker

Tables 3B-5(a) – (c) for the non-residential worker present the data for constituents in soil samples collected above the groundwater table. Tables 3B-5(a) – (c) present the data for soil samples collected in this Sub-area at or above a depth of 6.6 feet bgs.

Metals whose maximum concentrations did not exceed the background levels were eliminated from further consideration and include aluminum, barium, potassium, sodium, and vanadium (see Table 3B-5(c)).

Based on this evaluation, the following 33 constituents were considered for quantitative risk evaluation for soil exposures to the non-residential worker, and are presented in Tables 3B-5(a) – (c):

TOTAL METALS/INORGANICS		VOCs/TPH	
Antimony	Manganese	Acetone	n-Propylbenzene
Arsenic	Mercury	cis-1,2-Dichloroethene	p-Isopropyltoluene
Beryllium	Nickel	Chloroethane	sec-Butylbenzene
Chromium	Selenium	Ethylbenzene	Tetrachloroethene
Cobalt	Zinc	Isopropyl benzene	Toluene
Copper	Silver	Methyl ethyl ketone	trans-1,2-Dichloroethene
Cadmium	Thallium	Methylene chloride	Trichloroethene
		Naphthalene	Vinyl chloride
		n-Butylbenzene	Xylenes, total
			TPH (17 types)

Construction Worker

Tables 3B-5(a) – (c) for the construction worker present the data for constituents in soil samples collected above the typical construction depth. To be conservative, soil samples collected at or above a depth of 20 feet bgs in this Sub-area are included in Tables 3B-5(a) – (c).

Metals whose maximum concentrations did not exceed the background levels were eliminated from further consideration and include aluminum, barium, potassium, sodium, and vanadium (see Table 3B-5(c)).

Based on this evaluation, the following 37 constituents were considered for quantitative risk evaluation for soil exposures to the construction worker, and are presented in Tables 3B-5(a) – (c):

TOTAL METALS/INORGANICS		VOCs/TPH	
Antimony	Manganese	1,1-Dichloroethene	n-Propylbenzene
Arsenic	Mercury	1,2,4-Trimethylbenzene	o-Xylene
Beryllium	Nickel	Acetone	p-Isopropyltoluene
Cadmium	Selenium	cis-1,2-Dichloroethene	sec-Butylbenzene
Chromium	Silver	Chloroethane	Tetrachloroethene
Cobalt	Thallium	Ethylbenzene	Toluene
Copper	Zinc	Isopropyl benzene	trans-1,2-Dichloroethene
		m,p-Xylene	Trichloroethene
		Methyl ethyl ketone	Vinyl chloride
		Methylene chloride	Xylenes, total
		Naphthalene	TPH (17 types)
		n-Butylbenzene	

3.5.1.3 Sub-area 2C

Non-residential Worker

Tables 3C-5(a) – (c) for the non-residential worker present the data for constituents in soil samples collected above the groundwater table. Tables 3C-5(a) – (c) present the data for soil samples collected in this Sub-area at or above a depth of 5.1 feet bgs.

Metals whose maximum concentrations did not exceed the background levels were eliminated from further consideration and include lead (see Table 3C-5(c)).

Based on this evaluation, the following 1 constituent was considered for quantitative risk evaluation for soil exposures to the non-residential worker, and is presented in Table 3C-5(b):

VOCs/TPH
TPH (7 types)

Construction Worker

Tables 3C-5(a) – (c) for the construction worker present the data for constituents in soil samples collected above the typical construction depth. To be conservative, soil samples collected at or above a depth of 20 feet bgs in this Sub-area are included in Table 3C-5(a) – (c).

Metals whose maximum concentrations did not exceed the background levels were eliminated from further consideration and include lead (see Table 3C-5(c)).

Based on this evaluation, the following 6 constituents were considered for quantitative risk evaluation for soil exposures to the construction worker, and are also presented in Tables 3C-5(a) and (b):

VOCs/TPH	
Benzene	Toluene
Ethylbenzene	Xylenes, total
Methylene chloride	TPH (15 types)

3.5.2 Groundwater

Ground water samples were analyzed during the various investigations for a comprehensive list of constituents that included VOCs, PAHs, TPH, metals, and cyanide. Typical laboratory analysis methods that were used include SW-846 Methods 3510/DRO, 3550/DRO, 6010, 7060, 7421, 7470, 7471, 7740, 8021, 8240, 8260, OA1, and OA2. In 2004, additional sampling of groundwater was performed to speciate and fractionate TPH using Texas Methods TX1005 and TX1006 and SW-846 Method 8260. Appendix C-2 includes a comprehensive list of the groundwater analytical data that were detected in at least one sample.

Of the various constituents analyzed in groundwater, the following 34 constituents were detected in at least one groundwater sample:

TOTAL METALS	VOCs/TPH	
Arsenic	1,1,1-Trichloroethane	Naphthalene
Barium	1,1-Dichloroethane	n-Butylbenzene
Cadmium	1,1-Dichloroethene	n-Propylbenzene
Chromium	1,2,3-Trimethylbenzene	p-Isopropyltoluene
Lead	1,2,4-Trimethylbenzene	sec-Butylbenzene
Selenium	1,2-Dichloroethene (total)	tert-Butylbenzene
	Acetone	Tetrachloroethene
	Benzene	Trichlorofluoromethane
	cis-1,2-Dichloroethene	Toluene
	Ethylbenzene	trans-1,2-Dichloroethene
	Isopropylbenzene	Trichloroethene
	Methyl tertiary-butyl ether	Vinyl chloride
	Methylene Chloride	Xylenes, total
	Methyl isobutyl ketone	TPH (23 types)

The data from Appendix C-2 was segregated into data for each Sub-area and further screened for potential exposures to the non-residential worker and construction worker. Table 3-6 presents the list of samples used in the risk calculations.

3.5.2.1 Sub-area 2A

Tables 3A-7(a) – (c) present the data for constituents detected at least once in groundwater in Sub-area 2A. Constituents for which the target level criteria exceeded the maximum detected concentration were eliminated from further consideration and included ethylbenzene, methyl ter-butyl ether, methylene chloride, tetrachloroethene, toluene, xylenes (total), barium, and chromium.

The remaining constituents are listed in Tables 3A-7(a) – (c) and consist of 1 VOC, 2 metals, and TPH. These constituents are listed in the following table:

TOTAL METALS	VOCs/TPH	
Arsenic	Benzene	TPH (15 types)
Cadmium		

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for ground water.

Within Sub-area 2A, six groundwater sampling points exist, which have been sampled recently. Additionally, there are three historic groundwater monitoring wells in Sub-area 2A, which have not been sampled recently (see Table 3-8 for historic data back to 1990).

3.5.2.2 Sub-area 2B

Tables 3B-7(a) – (c) present the data for constituents detected at least once in groundwater in Sub-area 2B. Constituents for which the target level criteria exceeded the maximum detected concentration were eliminated from further consideration and included 1,1-dichloroethane, 1,1,1-trichloroethane, acetone, ethylbenzene, isopropylbenzene, methylene chloride, methyl isobutyl ketone, p-isopropyltoluene, tert-butylbenzene, trichlorofluoromethane, xylenes (total), barium, chromium, lead, and selenium.

The remaining constituents are listed in Tables 3B-7(a) – (c) and consist of 15 VOCs, 2 metals, and TPH. These constituents are listed in the following table:

TOTAL METALS	VOCs/TPH	
Arsenic	1,1-Dichloroethene	n-Propylbenzene
Cadmium	1,2,3-Trimethylbenzene	sec-Butylbenzene
	1,2,4-Trimethylbenzene	Tetrachloroethene
	Benzene	Toluene
	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene
	Methyl tertiary-butyl ether	Trichloroethene
	Naphthalene	Vinyl chloride
	n-Butylbenzene	TPH (16 types)

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for ground water.

Within Sub-area 2B, 47 groundwater sampling points exist, which have been sampled recently. There are no historic groundwater monitoring wells in Sub-area 2B (see Table 3-8 for historic data back to 1990).

3.5.2.3 Sub-area 2C

Tables 3C-7(a) – (c) present the data for constituents detected at least once in groundwater in Sub-area 2C. Constituents for which the target level criteria exceeded the maximum detected concentration were eliminated from further consideration and included ethylbenzene, methyl ter-butyl ether, toluene, and xylenes (total).

The remaining constituents are listed in Tables 3C-7(a) and (b) and consist of 1 VOC and TPH. These constituents are listed in the following table:

VOCs/TPH	
Benzene	TPH (16 types)

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for ground water.

Within Sub-area 2C, 12 groundwater sampling points exist, which have been sampled recently. Additionally, there are three historic groundwater monitoring wells in Sub-area 2C, which have not been sampled recently (see Table 3-8 for historic data back to 1990). To demonstrate the overall concentration trend, concentration vs. time plots for BTEX have been developed for one of these monitoring wells, MW-A13 (see Figure 3-3) for which historic data is available. This evaluation of the overall concentration trend indicates that concentrations are decreasing.

3.6 FREE PRODUCT

Table 3-9 presents the historic free product thicknesses measured in monitoring wells in Area 2. The table also compares the measured depth to water table and the screened interval. Note during periods when the depth to groundwater is above the screened interval, free product should not be detected. Table 3-9 identifies the monitoring wells in each Sub-area and those that had free product at installation and those that detected free product since 1992.

Based on the data, no free product has been documented in Sub-area 2A since 1990. The following monitoring wells in Sub-areas 2B and 2C have had measurable free product present since 1992:

- Sub-area 2B: MW-10S; and
- Sub-area 2C: MW-A10 and MW-A13.

Table 3-9 presents the historic free product thicknesses for Area 2 wells, which can be summarized as follows:

Sub-area 2A

- MW-A19 had sheen or no free product during the last 6 measurements from January 14, 1990 to December 27, 1994. The screened interval was 2.5-12 feet bgs. During the seven measurements from September 9, 1993 to December 26, 1996, the groundwater level was below the top of the screened interval.

Sub-area 2B

- MW-9S had sheen or no measurable free product during the last 10 measurements from February 21, 2001 to June 27, 2003. The screened interval was 6-16 feet bgs. During all of the measurements, the groundwater level was above the top of the screened interval; however, monitoring wells MW-10S and TP-6 are located downgradient to the northeast approximately 45 feet and 115 feet away, respectively. These two wells are discussed in next two bullets;

- MW-10S had sheen during 6 of the last 8 measurements from February 20, 2001 to May 4, 2004. Measurable free phase product was present March 5, 2002 (0.02 feet) and May 4, 2004 (0.01 feet). The screened interval was 5-15 feet bgs. During all of the measurements, the groundwater level was below the top of the screened interval; and

- TP-6 had sheen or no free product during the last 8 measurements from September 5, 2001 to June 17, 2003. The screened interval was 6-16 feet bgs. During three of the eight measurements, the groundwater level was above the top of the screened interval. The depth to groundwater vs. the top of the screened interval did not seem to make a difference, as both sheen and no free product were documented during measurements where the groundwater depth was above or below the top of the screened interval.

Sub-area 2C

- MW-A10 had one measurement each of sheen or 0.01-foot of free product during the last 15 measurements from September 23, 1993 to March 31, 1997. The other 13 measurements indicated no free product present, including 2 of the last 3 measurements. The screened interval was 4.5-14.5 feet bgs. During the last four measurements, the groundwater level was below the top of the screened interval with free product thicknesses from oldest to most recent of 0.01-foot, none, sheen, and none;

- MW-A12 had no free product present during the last 15 measurements from February 1, 1990 to September 28, 1995. The screened interval was 4.5-14.5 feet bgs. During six of the last 14 measurements, the groundwater level was below the top of the screened interval, with no free product thicknesses during any of the measurements, whether the water depth was above or below the top of the screened interval; and

- MW-A13 had sheen or no free product during last 23 measurements from November 15, 1996 to November 5, 1998. The screened interval was 4.5-14.5 feet bgs. During the 42 measurements from August 11, 1993 to November 5, 1998, the groundwater level was below the top of the screened interval.

Based on the above, following are the key conclusions:

- No measurable free product has been detected in any of the wells since 1996 except for two measurement in MW-10S of 0.02 ft (3/5/2002) and 0.01 ft (5/4/2004). Thus, there is no significant evidence of a free product plume. Sheen is indicative of very localized impacts.

- Dissolved BTEX concentrations have shown a generally decreasing trend. Thus, there is no evidence of an expanding dissolved phase plume.

3.7 EXPOSURE MODEL

3.7.1 Current Conditions for Sub-areas 2A, 2B, and 2C

Boeing currently has commercial workers within Area 2; however in the very near future, Boeing will shut down their operations at which point there will be no workers on-site. Hence the risk and exposure to these workers will not be quantified. The only receptor under current conditions would be the visitor/maintenance worker to the Area. As the exposure duration for the visitor/maintenance worker is (i) small relative to the on-site non-residential worker, and (ii) site conditions will change in 2005, the risk from any soil or groundwater impact will not be quantitatively evaluated for the visitor/maintenance worker.

3.7.2 Future Conditions for Sub-areas 2A, 2B, and 2C

Under future conditions, the land use is anticipated to remain non-residential, and a building may be constructed within this Area. Exhibit 3-1 presents the EM for the future non-resident.

EXHIBIT 3-1. EM FUTURE ON-SITE NON-RESIDENTIAL WORKER (SUB-AREAS 2A, 2B, AND 2C)

Scenario, Receptor, and Pathways / Routes Analyzed	C or NC	Justification
Dermal Contact with Surficial Soil	NC	The Area is entirely paved; therefore, contact with surficial soil is unlikely.
Ingestion of Surficial Soil	NC	The Area is entirely paved and likely to remain so; therefore, ingestion of surficial soil is unlikely.
Indoor Inhalation of Vapors from Subsurface Soil	C	**A number of volatile constituents were identified in soil within this Area. A building could be constructed above the impacted areas, hence this pathway is complete.**
Indoor Inhalation of Vapors from Groundwater	C	**A number of volatile constituents were identified in groundwater within this Area. A building could be constructed above the impacted areas, hence this pathway is complete.**

Notes: NC: Not Complete C: Complete

Exposure pathways highlighted in bold indicate that these pathways are complete and will be quantitatively evaluated.

In the future, construction work could also be performed within this Area. Exhibit 3-2 presents the EM for the potential future construction worker.

EXHIBIT 3-2. EM POTENTIAL FUTURE CONSTRUCTION WORKER (SUB-AREAS 2A, 2B, AND 2C)		
Scenario, Receptor, and Pathways / Routes Analyzed	**C or NC**	**Justification**
Dermal Contact with Soil	C	**Soil is impacted within the normal depth of construction; therefore, contact is possible.**
Accidental Ingestion of Soil	C	**Soil is impacted within the normal depth of construction; therefore, ingestion is possible.**
Outdoor Inhalation of Vapors and Particulates from Soil	C	**Soil is impacted within the normal depth of construction with volatile constituents; therefore, contact is possible.**
Dermal Contact with Groundwater	C	**Depth to groundwater ranges from 4 to 9 feet bgs, which is within the typical zone of construction. Hence this pathway is possible.**
Outdoor Inhalation of Vapors from Groundwater	C	**Groundwater is impacted with volatile constituents, hence this pathway is complete.**
Notes: NC: Not Complete C: Complete Exposure pathways highlighted in bold indicate that these pathways are complete and will be quantitatively evaluated.		

3.8 REPRESENTATIVE CONCENTRATIONS

Representative soil and groundwater concentrations for each Sub-area were determined as the average concentration. This was chosen as the sampling activities that have been performed have all been within the areas of most impact; and therefore, the mean concentration represents a conservative estimate of the overall impact to the Area. Further this is consistent with the MRBCA program.

Note representative concentrations in groundwater were estimated by first averaging the concentration in each well and then averaging the concentrations for the various wells located within the Sub-area.

3.8.1 Sub-area 2A

Tables 3A-10(a) and (b) present the soil average and maximum concentrations, and Table 3A-11 presents the groundwater average and maximum concentrations. The ratio of the maximum detected concentration to average concentration is also presented. As per the MRBCA process document, if this ratio exceeds 10, it may require an explanation. None of the constituents exceeded this ratio of 10.

3.8.2 Sub-area 2B

Tables 3B-10(a) and (b) present the soil average and maximum concentrations, and Table 3B-11 presents the groundwater average and maximum concentrations. The ratio of the maximum detected concentration to average concentration is also presented. As per the MRBCA process document, if this ratio exceeds 10, it may require an explanation. Following are the constituents and the locations/samples for which this ratio exceeds 10:

SOIL		GROUNDWATER	
Chemicals	**Locations/Samples**	**Chemicals**	**Locations/Samples**
Non-residential Worker		n-Butylbenzene	MW-10S
Acetone	SB-4 6-7	Tetrachloroethene	MW-7S, TP-1, & TP-5
Tetrachloroethene	TP-5-7	Trichloroethene	MW-5I, MW-7S, & TP-5
Cadmium	H-19-S-A	cis-1,2-Dichloroethene	TP-1 & TP-5
Lead	H-19-S-A	sec-Butylbenzene	MW-10S
Construction Worker		TPH-GRO	MW-5I, TP-1, TP-2, TP-3, & TP-5
Acetone	SB-4 6-7	TPH-DRO	TP-15 & TP-16
cis-1,2-Dichloroethene	SB-18-15 & TP-5-15	TPH-ORO	TP-23
Ethylbenzene	MW-7S-14		
Naphthalene	SB-30-6		
Tetrachloroethene	SB-18-15		
trans-1,2-Dichloroethene	TP-5-15		
Trichloroethene	SB-18-15		
Vinyl chloride	TP-5-15		
Xylenes, total	MW_7S-14		
Cadmium	H-19-S-A		
Lead	H-19-S-A		

However, several of these chemicals were at concentrations several orders of magnitude below the acceptable HQ of 1 and the acceptable IELCR of 1×10^{-5}, refer to Tables 3B-11(a) and 3B-11(b). Thus, despite the presence of localized exceedences, the target risk will not exceed the long-term unacceptable levels. However, to be conservative, we have identified (below) those constituents whose concentrations are within two orders of magnitude of acceptable risk (i.e., those chemicals with an IELCR > 1×10^{-7} and/or HQ > 0.01 for any receptor).

Based on this comparison, five constituents in groundwater, tetrachloroethene, trichloroethene, aliphatics >nC12 to nC16, aliphatics >nC16 to nC21, and aliphatics >nC21 to nC35, in the SWMU 17 area, specifically in the vicinity of TP-1, TP-5, TP-15, TP-16, TP-23, MW-5I, and MW-7S are within two orders of magnitude of acceptable risk.

3.8.3 Sub-area 2C

Tables 3C-10(a) and (b) present the soil average and maximum concentrations, and Table 3C-11 presents the groundwater average and maximum concentrations. The ratio of the maximum detected concentration to average concentration is also presented. As per the MRBCA process document, if this ratio exceeds 10, it may require an explanation. None of the constituents exceeded this ratio of 10.

3.9 CALCULATION OF RISK

Series of Tables 3-12(a) and 3-12(b) present the results for the non-residential worker and construction worker, respectively. The tables present the carcinogenic (IELCR) and non-carcinogenic (HQ and HI) risks for:

- Each COC,
- Each route of exposure,
- Cumulative risk for each COC,
- Cumulative risk for each route of exposure, and
- Total risk which is the sum of risk for all the COCs and all the routes of exposures.

Based on these tables, following are the key observations.

3.9.1 Sub-area 2A

3.9.1.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 3A-12(a), the cumulative IELCR is 5.97×10^{-8}, which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 3A-12(a) the cumulative HI for all COCs and all routes of exposure is 22.4, which exceeds the regulatory acceptable level of 1.0. Further examination of the table indicates that the primary contributors to HI are HQs for indoor inhalation of TPH-GRO and TPH-DRO from groundwater. The contribution to the HI from all the other COCs and routes of exposure is significantly less than 1.0.

3.9.1.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 3A-12(b), the cumulative IELCR is 3.52×10^{-7}, which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 3A-12(b), the cumulative HI is 0.31, which is below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1.0, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

3.9.2 Sub-area 2B

3.9.2.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 3B-12(a), the cumulative IELCR is 7.57 x 10^{-6}, which is below the regulatory acceptable level of 1 x 10^{-4}. Since the cumulative risk is less than 1 x 10^{-5}, clearly the risk for each COC and routes of exposure is less than 1 x 10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 3B-12(a) the cumulative HI for all COCs and all routes of exposure is 96.1, which exceeds the regulatory acceptable level of 1.0. Further examination of the table indicates that the primary contributors to HI are HQs for indoor inhalation of aliphatics C12 – C16, aliphatics C16 – C21, and aliphatics C21 – C35 from groundwater. The contribution to the HI from all the other COCs and routes of exposure is significantly less than 1.0.

3.9.2.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 3B-12(b), the cumulative IELCR is 1.89 x 10^{-5}, which is below the regulatory acceptable level of 1 x 10^{-4}. However, further examination of the table indicates that the IELCR for dermal contact of tetrachloroethene from groundwater is 1.51 x 10^{-5}, which is above the regulatory acceptable risk level of 1 x 10^{-5} for each COC and routes of exposure.

Non-carcinogenic Risk:

As shown in Table 3B-12(b), the cumulative HI is 3.1 which exceeded the regulatory acceptable level of 1.0. Further examination of the table indicates that the primary contributor to HI is HQ for dermal contact of tetrachloroethene from groundwater. This is 2.03, i.e., the contribution to the HI from all the other COCs and routes of exposure is significantly less than 1.0.

3.9.3 Sub-area 2C

3.9.3.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 3C-12(a), the cumulative IELCR is 2.02 x 10^{-8}, which is well below the regulatory acceptable level of 1 x 10^{-4}. Since the cumulative risk is less than 1 x 10^{-5}, clearly the risk for each COC and routes of exposure is less than 1 x 10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 3C-12(a), the cumulative HI is 0.95, which is below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

3.9.3.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 3C-12(b), the cumulative IELCR is 3.92×10^{-8}, which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 3C-12(b), the cumulative HI is 0.047, which is well below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

3.10 ECOLOGICAL RISK

The only potential ecological receptor in the area is Coldwater Creek, which flows north about 2,500 feet to the east of Area 2. There are no known unpermitted conduits present that could carry impacts from Area 2 to Coldwater Creek. Considering the geology, groundwater flow characteristics and the chemical types and concentrations of impacts in Area 2, it is not likely that migration of impacts from Area 2 to Coldwater Creek will occur. Quantitative evaluation of this pathway is presented in an addendum to this risk assessment. The Tier 1 ecological screening checklists have been completed for this Area, and are presented as Attachment 3-A and Attachment 3-B. These checklists identified no potential ecological receptors or issues.

3.11 CONCLUSIONS

Carcinogenic and non-carcinogenic risks to the non-residential worker and construction worker were calculated for each Sub-area. Key conclusions of the risk evaluation are:

Sub-area 2A

The cumulative non-carcinogenic risk for the non-residential worker exceeded the target risk. The primary contributor to the risk was indoor inhalation of TPH-GRO and TPH-DRO from groundwater. The calculated carcinogenic risk for the non-residential worker was below the acceptable target risk. The calculated risks for all the COCs and all potentially complete routes of exposure for the construction worker are below the acceptable target risks.

Sub-area 2B

The cumulative non-carcinogenic risk for the non-residential worker exceeded the target risk. The primary contributor to the risk was indoor inhalation of aliphatics C12 – C16, aliphatics C16 – C21, and aliphatics C21 – C35 from groundwater. The calculated carcinogenic risk for the non-residential worker was below the acceptable target risk.

The cumulative non-carcinogenic risk for the construction worker exceeded the target risk. The primary contributor to the risk was dermal contact of tetrachloroethene in groundwater. The carcinogenic risk of tetrachloroethene exceeded the target risk for dermal contact of groundwater.

Sub-area 2C

The calculated risks for all the COCs and all potentially complete routes of exposure for the construction worker and the non-residential worker are below the acceptable target risks.

Table 3-1
Summary of Underground Storage Tanks (USTs) Present Historically within Area 2: Demolished Area
Boeing Tract 1, St. Louis, Missouri

UST/AST Number	Sub-area	Location	Volume (Gallons)	Contents	Construction Material	Year Installed	Status	Comments
B25	2C	NWEC of Bldg. 45	335	Diesel	Single Wall Steel	1958	Removed 1987	Excavated
B31	2A	NWEC of Building 45K	4380	Waste JP-4	Fiberglass Reinforced Plastic	1983	Removed 1993	Excavated
B32	2A	NWEC of Building 51	6000	Solvents	Single Wall Steel	1977	Removed 1986	Excavated

Notes:

Two former 15,000 gallon ASTs for fuel oil storage were located north of Building 48 and west of Building 48A and distribution lines ran east-west along the south side of Building 51 (MACTEC, 2004).

14 USTs owned by Airport Terminal Services located off-site to the west of Area 2 containing gasoline and ranging in size for 1,000 gallons to 20,000 gallons (MACTEC, 2004).

Table 3-2
Soil Boring Information for Area 2: Demolished Area
Boeing Tract 1, St. Louis, Missouri

SUB-AREA 2A		SUB-AREA 2B		SUB-AREA 2C	
Boring	**Date Drilled**	**Boring**	**Date Drilled**	**Boring**	**Date Drilled**
1	6/28/1988	51A-1	11/1/1994	B48E1	7/23/2003
2	6/28/1988	51B-1	11/1/1994	B48S1	11/14/2002
3	6/28/1988	52-H19-S	7/1/1995	B48S10	11/21/2002
52-1	11/1/1994	52-H19-S2	7/1/1995	B48S11	6/30/2003
52-2	11/1/1994	52-H19-SE	7/1/1995	B48S2	11/15/2002
B-7	1/10/2002	B48I1	11/11/2002	B48S3	11/15/2002
B-8	1/10/2002	B48I2	11/11/2002	B48S4D	NA
B-27	1/10/2002	B48N1	11/11/2002	B48S5	11/19/2002
B-2002	10/9/2001	H-12E	12/6/1993	B48S6	11/19/2002
B51W1	7/2/2003	H-12 Drain	12/6/1993	B48S7	11/20/2002
B51W2	7/2/2003	H-12S	12/6/1993	B48S8	11/20/2002
B51W3	7/23/2002	H-19E	12/6/1993	B48S9	11/21/2002
B51W4	7/23/2002	H-19N	12/6/1993		
Sidewall	8/10/1993	H-19S	12/6/1993		
U-Tank	8/10/1993	H-19W	12/6/1993		
		MW-7S	12/4/2000		
		S17B1	NA		
		S17B10	NA		
		S17B11	NA		
		S17B12(MW10S)	NA		
		S17B13	NA		
		S17B14(MW10S)	NA		
		S17B15	NA		
		S17B16	NA		
		S17B17	NA		
		S17B18	NA		
		S17B2	NA		
		S17B20	NA		
		S17B3	NA		
		S17B4	NA		
		S17B5	NA		
		S17B6	NA		
		S17B7	NA		
		S17B8	NA		
		S17B9	NA		
		SB-1	2/4/1998		
		SB-10	4/20/1998		
		SB-12	12/4/2000		
		SB-13	12/4/2000		
		SB-15	12/4/2000		
		SB-16	12/4/2000		
		SB-17	12/5/2000		
		SB-18	12/5/2000		

Table 3-2
Soil Boring Information for Area 2: Demolished Area
Boeing Tract 1, St. Louis, Missouri

SUB-AREA 2A		SUB-AREA 2B		SUB-AREA 2C	
Boring	**Date Drilled**	**Boring**	**Date Drilled**	**Boring**	**Date Drilled**
		SB-2	2/4/1998		
		SB-20	12/6/2000		
		SB-21	9/5/2001		
		SB-22	9/5/2001		
		SB-23	9/5/2001		
		SB-24	9/5/2001		
		SB-25	9/5/2001		
		SB-26	9/5/2001		
		SB-27	9/5/2001		
		SB-28	9/5/2001		
		SB-29	9/6/2001		
		SB-3	2/4/1998		
		SB-30	9/6/2001		
		SB-31	9/6/2001		
		SB-32	9/6/2001		
		SB-33	9/6/2001		
		SB-34	9/6/2001		
		SB-35	10/15/2001		
		SB-36	10/15/2001		
		SB-37	10/15/2001		
		SB-38	10/15/2001		
		SB-39	10/15/2001		
		SB-4	2/4/1998		
		SB-40	10/15/2001		
		SB-5	2/4/1998		
		SB-6	2/5/1998		
		SB-7	2/6/1998		
		SB-8	2/6/1998		
		SB-9	4/21/1998		
		TP-5	12/4/2000		

Note:
NA: Not available

Table 3-3
Monitoring Well Information within Area 2: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Monitoring Well	Sub-area	Diameter (inches)	Screened Interval (ft bgs)	Total Depth (ft)	Installation Date	Status	# of Times Sampled	Last Time Sampled	Free Product at Installation	Free Product Observed Since 1992
MW-A6	2A	2	2.5-12.5	15	7/14/1989	Inactive	NA	6/30/1998	No	No
MW-A7	2A	2	2.5-12.5	15	7/14/1989	Inactive	2	6/30/1998	No	No
MW-A8	2A	2	2.5-12.5	15	7/17/1989	Inactive	2	7/26/2001	No	No
MW-A16	2A	2	2.5-12.5	13	8/3/1989	Inactive	8	6/30/1998	No	No
MW-A19	2A	2	2.5-12.5	12.5	8/7/1989	Inactive	7	6/30/1998	Yes	No
MW-5I	2B	2	32.0-42.0	45	4/21/1998	Active	11	6/27/2003	No	No
MW-6S	2B	2	5.0-15.0	15	4/20/1998	Active	7	6/19/2003	No	No
MW-7S	2B	4	3.0-15.0	16	12/5/2000	Active	7	6/19/2003	No	No
MW-10S	2B	2	5.0-15.0	16	12/12/2000	Active	7	6/17/2003	Yes	Yes
MW-11D	2B	2	64.0-74.0	75.25	12/18/2000	Active	10	6/26/2003	No	No
MW-11I	2B	2	32.0-40.0	40	12/13/2000	Active	10	6/25/2003	No	No
MW-11S	2B	2	6.5-16.5	16.5	12/12/2000	Active	10	6/17/2003	No	No
TP-6	2B	1	6.0-16.0	16	9/5/2001	Active	8	6/17/2003	Yes	Yes
MW-8I	2B	2	32.0-40.0	40	12/18/2000	Active	10	6/26/2003	No	No
MW-8S	2B	2	8.0-16.0	16	12/18/2000	Active	10	6/19/2003	No	No
MW-9S	2B	2	6.0-16.0	16	12/20/2000	Active	10	6/27/2003	Yes	Yes
MW-A10	2C	2	4.5-14.5	15	7/18/1989	Inactive	7	4/30/2002	No	Yes
MW-A11	2C	2	8.5-18.5	19	7/19/1989	Inactive	NA	4/30/2002	Yes	Yes
MW-A12	2C	2	4.5-14.5	15	8/2/1989	Active	7	4/30/2002	Yes	Yes
MW-A13	2C	2	4.5-14.5	15	8/2/1989	Active	13	3/20/2003	Yes	Yes
MW-A9	2C	2	4.5-14.5	15	7/17/1989	Inactive	NA	N/A	Yes	N/A
MW-A20	2C	2	8.5-18.5	19	8/7/1989	Inactive	NA	N/A	No	Yes

Notes:
no: No free product observed historically
yes: Free product observed historically
NA: No information available
ft bgs: Feet below ground surface
ft: Feet
The thickness of free product is tabulated in Table 3-3(a)

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Soil Samples Used in Average Concentrat ulations in Area 2: Demolished Area

Boeing Tract 1, St. Louis, Missouri

	Volatile Organic Compounds		Total Petroleum Hydrocarbons		Polynuclear Aromatic Hydrocarbons		Polychlorinated Biphenyls		Metals	
	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker
2A	B51W1-6	B51W1-6	B51W2-6	B51W2-6					52-1 (0-1)	52-1 (0-1)
	B51W2-6	B51W2-6	B-7 (na)	B-7 (na)					52-1 (1-2)	52-1 (1-2)
	B51W4-6	B51W3-12	B-8 (na)	B-8 (na)					52-2 (0-1)	52-2 (0-1)
	52-1 (0-1)	B51W4-6	B-27 (na)	B-27 (na)					52-2 (1-2)	52-2 (1-2)
	52-2 (0-1)	52-1 (0-1)	B-2002 (6-7.5)	B-2002 (6-7.5)					B51W4-6	B51W3-12
	B7	52-2 (0-1)								B51W4-6
	B8	B7								
	B-2002 (6-7.5)	B8								
		B-2002 (6-7.5)								
2B	51A-1 (0-1)	51A-1 (0-1)	SB-20-7	SB-15-9					51A-1 (0-1)	51A-1 (0-1)
	51B-1 (0-1)	51B-1 (0-1)	SB-25-6	SB-16-9					51B-1 (0-1)	51B-1 (0-1)
	51A-1 (1-2)	51A-1 (1-2)	SB-26-6	SB-20-15					51A-1 (1-2)	51A-1 (1-2)
	51B-1 (1-2)	51B-1 (1-2)	SB-30-6	SB-20-7					51B-1 (1-2)	51B-1 (1-2)
	SB-1 2.5-4	MW-7S-14	SB-31-6	SB-21-8					SB-1 2.5-4	SB-1 12-13
	SB-1 2.5-4 D	SB-1 12-13	SB-33-7	SB-22-8					SB-1 2.5-4 D	SB-1 16-17
	SB-10 4-5	SB-1 16-17	SB-5 5.5-7	SB-23-8					SB-2 3-4.5	SB-1 2.5-4
	SB-2 3-4.5	SB-1 2.5-4		SB-24-8					SB-4 6-7	SB-1 2.5-4 D
	SB-20-7	SB-1 2.5-4 D		SB-25-6					H-19-W-A (0.5-1)	SB-2 11-12.5
	SB-25-6	SB-10 14-15		SB-26-6					H-19-S-A (0.5-1)	SB-2 3-4.5
	SB-30-6	SB-10 4-5		SB-27-8					H-19-N-A (0.5-1)	SB-3 10.5-11.5
	SB-31-6	SB-13-9		SB-28-8					H-19-E-B (0.5-1)	SB-4 11.5-13.5
	SB-35-6	SB-15-9		SB-29-8					H-19-E-A (2.5-3)	SB-4 14-16
	SB-4 6-7	SB-16-9		SB-30-6					H-12-E-A (0.5-1)	SB-4 6-7
	SB-5 5.5-7	SB-17-10		SB-31-6					H-12-E-B (2.5-3)	SB-5 14-16
	SB-7 3.5-4.5	SB-18-11		SB-32-8					H-12-S-A (0.5-1)	H-19-W-A (0.5-1)
	SB-8 6-7	SB-18-15		SB-33-7					H-12-S-B (2.5-3)	H-19-S-A (0.5-1)
	TP-5-7	SB-2 11-12.5		SB-34-8					H-12-DRAIN	H-19-N-A (0.5-1)
		SB-2 3-4.5		SB-5 5.5-7						H-19-E-B (0.5-1)
		SB-20-15		SB-6 9.5-11						H-19-E-A (2.5-3)
		SB-20-7								H-12-E-A (0.5-1)
		SB-21-8								H-12-E-B (2.5-3)
		SB-22-8								H-12-S-A (0.5-1)
		SB-23-8								H-12-S-B (2.5-3)
		SB-24-8								H-12-DRAIN
		SB-25-6								
		SB-29-8								
		SB-3 10.5-11.5								
		SB-30-6								
		SB-31-6								
		SB-35-6								
		SB-4 11.5-13.5								
		SB-4 14-16								
		SB-4 6-7								
		SB-5 14-16								
		SB-5 5.5-7								
		SB-6 9.5-11								
		SB-7 3.5-4.5								
		SB-7 7.5-8.5								
		SB-8 11.5-12.5								
		SB-8 6-7								
		TP-5-15								
		TP-5-7								
2C		B48E1-8	B48S11-3	B48S10-7					B48E1-8	B48E1-8
		B48S1-6		B48S11-3						
		B48S3-10		B48S1-6						
		B48S5-6		B48S3-10						
		B48S7-7		B48S5-6						
		B48S8-7		B48S7-7						
				B48S8-7						
				B48S9-8						

Note:

- analysis type not performed

Table 3A-5(a)
Soil Constituents Average Concentrations for VOCs in Sub-area 2A: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs							
	BENZENE	DICHLORODIFLUOROMETHANE	ETHYLBENZENE	METHYLENE CHLORIDE	TETRACHLOROETHENE	TOLUENE	TRICHLOROETHENE	XYLENES, TOTAL
Non- Residential Worker								
B51W1-6	25	4.3	25	0.5	0.5	25	0.5	25
B51W2-6	25	NA	25	NA	NA	25	NA	90
B51W4-6	2.5	2.5	2.5	5.3	3.9	2.5	2.5	2.5
Sidewall (na)	2500	NA	2500	ND	ND	57	ND	NA
52-1 (0-1)	ND	NA	ND	ND	12	ND	ND	NA
52-2 (0-1)	ND	NA	ND	ND	26	ND	ND	NA
B-7 (na)	102	NA	25	NA	NA	5.3	NA	NA
B-8 (na)	218	NA	28	NA	NA	5	NA	NA
B-2002 (6-7.5)	225	NA	25	NA	NA	13	NA	NA
Average Concentration - Only Samples With VOC Detections	**442.5**	**3.4**	**375.786**	**2.9**	**10.6**	**18.971**		**39.167**
Construction Worker								
B51W1-6	25	4.3	25	0.5	0.5	25	0.5	25
B51W2-6	25	NA	25	NA	NA	25	NA	90
B51W3-12	2.5	2.5	2.5	4.8	10	2.6	2.6	2.5
B51W4-6	2.5	2.5	2.5	5.3	3.9	2.5	2.5	2.5
Utank (na)	2500	NA	2500	ND	ND	472	ND	NA
Sidewall (na)	2500	NA	2500	ND	ND	57	ND	NA
52-1 (0-1)	ND	NA	ND	ND	12	ND	ND	NA
52-2 (0-1)	ND	NA	ND	ND	26	ND	ND	NA
B-7 (na)	102	NA	25	NA	NA	5.3	NA	NA
B-8 (na)	218	NA	28	NA	NA	5	NA	NA
B-2002 (6-7.5)	225	NA	25	NA	NA	13	NA	NA
Average Concentration - Only Samples With VOC Detections	**622.22**	**3.10**	**570.33**	**3.53**	**10.48**	**67.49**	**1.87**	**30.00**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
VOCs - Volatile Organic Compounds
na - not available
NA - Not Analyzed
ND - Not Detected
Bold indicates a detection

Table 3A-5(b)
Soil Constituents Average Concentrations for TPHs in Sub-area 2A: Demolished Area Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B51W2-6	B-7 (na)	B-8 (na)	B-27 (na)	B-2002 (6-7.5)	Side Wall	Overall Area Average (ug/kg)
TPH - DRO							**TPH - DRO**
8/10/1993	NA	NA	NA	NA	NA	**640,000**	
7/2/2003	2,500	**4,780**	**12,100**	**3,215**	**45,920**	NA	
7/23/2003	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - DRO	2,500	4,780	12,100	3,215	45,920	640,000	**118,086**
TPH - GRO							**TPH - GRO**
7/2/2003	**27,000**	**4,640**	**10,400**	5,000	**15,100**	NA	
7/23/2003	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - GRO	27,000	4,640	10,400	5,000	15,100		**12,428**
TPH - ORO							**TPH - ORO**
7/2/2003	2500	NA	NA	NA	NA	NA	
7/23/2003	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - ORO	2,500						**2,500**

Notes:
Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 3A-5(b)
Soil Constituents Average Concentrations for TPHs in Sub-area 2A: Demolished Area Construction Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B51W2-6	B-7 (na)	B-8 (na)	B-27 (na)	B-2002 (6-7.5)	U Tank	Side Wall	Overall Area Average (ug/kg)
TPH - DRO								**TPH - DRO**
8/10/1993	NA	NA	NA	NA	NA	**14,890,000**	**640,000**	
7/2/2003	2,500	**4,780**	**12,100**	**3,215**	**45,920**	NA	NA	
7/23/2003	NA	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - DRO	2,500	4,780	12,100	3,215	45,920	14,890,000	640,000	**2,228,359**
TPH - GRO								**TPH - GRO**
7/2/2003	**27,000**	**4,640**	**10,400**	5,000	**15,100**	NA	NA	
7/23/2003	NA	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - GRO	27,000	4,640	10,400	5,000	15,100			**12,428**
TPH - ORO								**TPH - ORO**
7/2/2003	2,500	NA	NA	NA	NA	NA	NA	
7/23/2003	NA	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - ORO	2500							**2,500**

Notes:
Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 3A-5(b)
Soil Constituents Average Concentrations for Metals in Sub-area 2A: Demolished Area Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)																			
	ALUMINUM	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CALCIUM	CHROMIUM	COBALT	COPPER	IRON	LEAD	MAGNESIUM	MANGANESE	MERCURY	NICKEL	POTASSIUM	SODIUM	VANADIUM	ZINC
52-1 (0-1)	14,200,000	3,400	30,700	201,000	1,130	243.5	8,400,000	16,100	4,560	15,100	14,600,000	29,200	1,980,000	143,000	33	15,200	1,260,000	2,930,000	32,500	45,600
52-1 (1-2)	17,400,000	3,630	34,500	254,000	1,270	243.5	3,780,000	17,500	11,200	13,000	19,600,000	30,500	2,350,000	613,000	26	19,900	1,100,000	1,830,000	39,300	44,100
52-2 (0-1)	14,200,000	4,950	60,400	129,000	943	2,190	16,000,000	20,200	4,420	93,000	21,900,000	140,000	7,510,000	249,000	112	14,000	2,210,000	1,340,000	34,100	219,000
52-2 (1-2)	18,900,000	3,160	29,900	173,000	1,080	243.5	5,050,000	15,800	4,320	13,000	21,600,000	22,600	2,560,000	444,000	23	13,900	1,140,000	1,580,000	31,600	38,000
B51W4-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8530	NA	NA	NA	NA	NA	NA	NA	NA
Average Concentration - Only Samples With Metals Detections	16,175,000	3,785	38,875	189,250	1,106	730	8,307,500	17,400	6,125	33,525	19,425,000	46,166	3,600,000	362,250	49	15,750	1,427,500	1,920,000	34,375	86,675

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 3A-5(c)
Soil Constituents Average Concentrations for Metals in Sub-area 2A: Demolished Area, Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)																			
	ALUMINUM	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CALCIUM	CHROMIUM	COBALT	COPPER	IRON	LEAD	MAGNESIUM	MANGANESE	MERCURY	NICKEL	POTASSIUM	SODIUM	VANADIUM	ZINC
52-1 (0-1)	14,200,000	3,400	30,700	201,000	1,130	243.5	8,400,000	16,100	4,560	15,100	14,600,000	29,200	1,980,000	143,000	33	15,200	1,260,000	2,930,000	32,500	45,600
52-1 (1-2)	17,400,000	3,630	34,500	254,000	1,270	243.5	3,780,000	17,500	11,200	13,000	19,600,000	30,500	2,350,000	613,000	26	19,900	1,100,000	1,830,000	39,300	44,100
52-2 (0-1)	14,200,000	4,950	60,400	129,000	943	2,190	16,000,000	20,200	4,420	93,000	21,900,000	140,000	7,510,000	249,000	112	14,000	2,210,000	1,340,000	34,100	219,000
52-2 (1-2)	18,900,000	3,160	29,900	173,000	1,080	243.5	5,050,000	15,800	4,320	13,000	21,600,000	22,600	2,560,000	444,000	23	13,900	1,140,000	1,580,000	31,600	38,000
B51W3-12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7810	NA	NA	NA	NA	NA	NA	NA	NA
B51W4-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8530	NA	NA	NA	NA	NA	NA	NA	NA
Average Concentration - Only Samples With Metals Detections	16,175,000	3,785	38,875	189,250	1,106	730	8,307,500	17,400	6,125	33,525	19,425,000	39,773	3,600,000	362,250	49	15,750	1,427,500	1,920,000	34,375	86,675

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 3A-7(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 2A: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)						
	BENZENE	ETHYLBENZENE	METHYL TERT-BUTYL ETHE	METHYLENE CHLORIDE	TETRACHLOROETHENE	TOLUENE	XYLENES, TOTAL
B51W1W	1.75	1.75	2.5	1	**3.5**	1.75	2.5
B51W2W	**60.9**	2.5	2.5	NA	NA	**60.8**	**179**
B51W3W	2	2.5	3.67	6.05	2.50	2.5	2.5
B51W4W	1.75	1.75	3	10	**4.8**	1.75	2.5
B-7	**817**	**130**	**20**	NA	NA	**33**	**140**
Average Concentration - Only Samples With VOC Detections	**220.35**	**34**	**7**	**5.5**	**4.15**	**24.33**	**81**

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed
No VOCs except methylene chloride detected in the sample
Bold indicates a detection

Table 3B-5(a)
Soil Constituents Average Concentrations for VOCs in Sub-area 2B: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)																					
	1,1-DICHLOROETHENE	1,2,4-TRIMETHYLBENZENE	ACETONE	CHLOROETHANE	CIS-1,2-DICHLOROETHENE	ETHYLBENZENE	ISOPROPYL BENZENE	M,P-XYLENE	METHYL ETHYL KETONE (MEK)	METHYLENE CHLORIDE	NAPHTHALENE	N-BUTYLBENZENE	N-PROPYLBENZENE	O-XYLENE	P-ISOPROPYLTOLUENE	SEC-BUTYLBENZENE	TETRACHLOROETHENE	TOLUENE	TRANS-1,2-DICHLOROETHENE	TRICHLOROETHENE	VINYL CHLORIDE	XYLENES, TOTAL
Non- Residential Worker																						
51A-1 (0-1)	ND	NA	140	NA	ND	ND	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	290,000	ND	44	ND	NA	NA
51B-1 (0-1	ND	NA	88	NA	ND	ND	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	40,000	ND	14	ND	NA	NA
51A-1 (1-2)	ND	NA	130	NA	ND	ND	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	880	ND	17	ND	NA	NA
51B-1 (1-2)	ND	NA	12.5	NA	ND	ND	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	760	ND	6	ND	NA	NA
SB-1 2.5-4	NA	NA	240	NA	1600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	24,000	NA	9.6	NA	NA	41
SB-1 2.5-4 D	NA	NA	800	NA	90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	32,000	NA	36	NA	NA	230
SB-10 4-5	3.15	NA	26	6.5	3.15	3.15	NA	NA	6.5	24	NA	NA	NA	NA	NA	NA	3.15	3.15	3.15	9.3	6.5	3.15
SB-2 3-4.5	NA	NA	25	NA	3.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18,000	NA	3.25	NA	NA	3.25
SB-20-7	25	25	50	50	25	330	110	25	50	40	25	330	250	25	NA	180	25	60	25	25	50	1,000
SB-25-6	25	25	1250	25	25	25	25	NA	6,100	125	25	25	25	NA	25	25	25	125	25	25	25	75
SB-30-6	125	125	6000	125	125	125	125	NA	6000	600	2,100	390	125	NA	125	125	125	600	125	125	125	375
SB-31-6	2.5	2.5	125	2.5	2.5	2.5	210	NA	125	12.5	2.5	1,200	420	NA	130	540	2.5	12.5	2.5	2.5	2.5	7.5
SB-35-6	2.5	NA	NA	NA	2.5	2.5	NA	2.5	NA	2.5	NA	NA	NA	2.5	NA	NA	2.5	2.5	2.5	2.5	9.6	NA
SB-4 6-7	NA	NA	27,000	NA	13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	12,000	NA	3.35	NA	NA	3.35
SB-5 5.5-7	3.25	NA	42	6.5	3.25	4.4	NA	9	6.5	3.25	NA	NA	NA	4.4	NA	NA	35	3.25	3.25	3.25	6.5	13.5
SB-7 3.5-4.5	3.3	NA	68	6.5	3.3	13	NA	NA	82	6.7	NA	NA	NA	NA	NA	NA	4,200	20	3.3	44	6.5	3.3
SB-8 6-7	3.15	NA	30	6.5	3.15	3.15	NA	NA	52	6.7	NA	NA	NA	NA	NA	NA	12	3.15	3.15	3.15	6.5	3.15
TP-5-7	25	25	50	48	500	25	25	25	50	28	25	25	25	25	NA	25	1,700,000	25	25	2,200	50	25
Average Concentration - Only Samples With VOC Detections			2,122.15	30.72	171.36	53.37	99.00		1,385.78	84.87	435.50	394.00	169.00		93.33	179.00	117,893	85.46	19.50	243.97	28.81	137.17
Construction Worker																						
51A-1 (0-1)	ND	NA	140	NA	ND	ND	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	290,000	ND	44	ND	NA	NA
51B-1 (0-1	ND	NA	88	NA	ND	ND	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	40,000	ND	14	ND	NA	NA
51A-1 (1-2)	ND	NA	130	NA	ND	ND	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	880	ND	17	ND	NA	NA
51B-1 (1-2)	ND	NA	12.5	NA	ND	ND	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	760	ND	6	ND	NA	NA
MW-7S-14	NA	NA	NA	NA	NA	2,700	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,300	NA	NA	NA	5,100
SB-1 12-13	NA	NA	21	NA	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9,100	NA	3.2	NA	NA	3.2
SB-1 16-17	NA	NA	20	NA	88	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	58,000	NA	3.4	NA	NA	7.7
SB-1 2.5-4	NA	NA	240	NA	1600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	24,000	NA	9.6	NA	NA	41
SB-1 2.5-4 D	NA	NA	800	NA	90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	32,000	NA	36	NA	NA	230
SB-10 14-15	3.7	NA	180	7.5	3.7	3.7	NA	NA	50	69	NA	NA	NA	NA	NA	NA	3.7	3.7	24	28	7.5	3.7
SB-10 4-5	3.15	NA	26	6.5	3.15	3.15	NA	NA	6.5	24	NA	NA	NA	NA	NA	NA	3.15	3.15	3.15	9.3	6.5	3.15
SB-13-9	3.2	NA	13	6.5	19	3.2	NA	NA	13	20	NA	NA	NA	NA	NA	NA	3.2	3.2	1.6	3.2	3.2	3.2
SB-15-9	3.25	NA	39	6.5	1.6	3.25	NA	NA	13	26	NA	NA	NA	NA	NA	NA	3.25	3.25	1.6	3.25	3.25	3.25
SB-16-9	3.15	NA	34	6.5	1.6	3.15	NA	NA	12.5	27	NA	NA	NA	NA	NA	NA	3.15	3.15	1.6	3.15	3.15	3.15
SB-17-10	2.5	2.5	5	5	2.5	2.5	2.5	2.5	5	8	2.5	2.5	2.5	2.5	NA	2.5	6	2.5	2.5	2.5	5	2.5
SB-18-11	2.5	2.5	5	5	140	2.5	2.5	2.5	5	8	2.5	2.5	2.5	2.5	NA	2.5	800	2.5	2.5	90	5	2.5
SB-18-15	25	35	130	94	68,000	400	25	1,600	50	43	25	25	25	540	NA	25	9,300,000	1,600	2500	14,000	63	2,100
SB-2 11-12.5	NA	NA	6.5	NA	46	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,100	NA	3.2	NA	NA	3.2
SB-2 3-4.5	NA	NA	25	NA	3.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18,000	NA	3.25	NA	NA	3.25
SB-20-15	2.5	2.5	90	5	2.5	5	5	2.5	36	8	2.5	13	8	2.5	NA	8	2.5	5	2.5	2.5	5	56
SB-20-7	25	25	50	50	25	330	110	25	50	40	25	330	250	25	NA	180	25	60	25	25	50	1000
SB-21-8	25	25	1250	25	25	25	25	NA	3,900	125	25	25	25	NA	25	97	25	125	25	25	25	75
SB-22-8	25	25	1250	25	25	25	25	NA	1250	125	25	910	25	NA	25	520	25	125	25	25	25	75
SB-23-8	25	25	1250	25	25	25	25	NA	3,600	125	25	25	25	NA	25	25	25	125	25	25	25	75
SB-24-8	25	25	1250	25	25	25	25	NA	4,200	125	25	25	25	NA	25	97	25	125	25	25	25	75
SB-25-6	25	25	1250	25	25	25	25	NA	6,100	125	25	25	25	NA	25	25	25	125	25	25	25	75
SB-29-8	2.5	2.5	125	2.5	2.5	2.5	2.5	NA	125	12.5	2.5	2.5	2.5	NA	2.5	27	2.5	12.5	2.5	2.5	2.5	7.5
SB-3 10.5-11.5	NA	NA	16	NA	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3,000	NA	3.35	NA	NA	3.35
SB-30-6	125	125	6000	125	125	125	125	NA	6000	600	2,100	390	125	NA	125	125	125	600	125	125	125	375
SB-31-6	2.5	2.5	125	2.5	2.5	2.5	210	NA	125	12.5	2.5	1,200	420	NA	130	540	2.5	12.5	2.5	2.5	2.5	7.5
SB-35-6	2.5	NA	NA	NA	2.5	2.5	NA	2.5	NA	2.5	NA	NA	NA	2.5	NA	NA	2.5	2.5	2.5	2.5	9.6	NA
SB-4 11.5-13.5	NA	NA	7	NA	760	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	200,000	NA	3.6	NA	NA	180
SB-4 14-16	NA	NA	400	NA	11,900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	240,000	NA	9500	NA	NA	9500
SB-4 6-7	NA	NA	27,000	NA	13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	12,000	NA	3.35	NA	NA	3.35
SB-5 14-16	NA	NA	38.5	NA	280	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	AN	3,600	NA	19	NA	NA	19
SB-5 5.5-7	3.25	NA	42	6.5	3.25	4.4	NA	9	6.5	3.25	NA	NA	NA	4.4	NA	NA	35	3.25	3.25	3.25	6.5	13.5
SB-6 9.5-11	3.3	NA	15	3.3	3.3	4.4	NA	9	6.5	3.3	NA	NA	NA	4.4	NA	NA	3.3	3.3	3.3	3.3	6.5	13.5
SB-7 3.5-4.5	3.3	NA	68	6.5	3.3	13	NA	NA	82	6.7	NA	NA	NA	NA	NA	NA	4,200	20	3.3	44	6.5	3.3
SB-7 7.5-8.5	3.2	NA	35	6.5	3.2	3.2	NA	NA	52	6.5	NA	NA	NA	NA	NA	NA	9.7	3.2	3.2	3.2	6.5	3.2
SB-8 11.5-12.5	3.15	NA	25	6.5	10	3.15	NA	NA	50	3.15	NA	NA	NA	NA	NA	NA	58	3.15	3.15	3.15	6.5	3.15
SB-8 6-7	3.15	NA	30	6.5	3.15	3.15	NA	NA	52	6.7	NA	NA	NA	NA	NA	NA	12	3.15	3.15	3.15	6.5	3.15
TP-5-15	200	2.5	130	5	57,000	49	2.5	140	5	5	2.5	2.5	2.5	42	NA	2.5	440	650	7,200	1,900	560	180
TP-5-7	25	25	50	48	500	25	25	25	50	28	25	25	25	25	NA	25	1,700,000	25	25	2,200	50	25
Average Concentration - Only Samples With VOC Detections	21.33	23.33	1,034.43	20.63	3,705.50	136.40	42.33	181.80	994.35	58.82	154.33	200.20	65.87	65.08	47.81	113.43	284,245.37	176.79	469.89	688.31	39.45	507.4

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs

VOCs - Volatile Organic Compounds
NA - Not Analyzed
Bold indicates a detection

Table 3B-5(b)

Soil Constituents Average Concentrations for TPHs in Sub-area 2B: Demolished Area Non-Residential Worker

Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	SB-20-7	SB-25-6	SB-26-6	SB-30-6	SB-31-6	SB-33-7	SB-5 5.5-7	Overall Area Average (ug/kg)
TPH - DRO								**TPH - DRO**
2/5/1998	NA	NA	NA	NA	NA	NA	**1,900,000**	
12/4/2000	NA	NA	NA	NA	NA	NA	NA	
12/5/2000	NA	NA	NA	NA	NA	NA	NA	
12/6/2000	**900,000**	NA	NA	NA	NA	NA	NA	
9/5/2001	NA	**9,300**	**1,400,000**	NA	NA	NA	NA	
9/6/2001	NA	NA	NA	**1,400,000**	**110,000**	**5,500**	NA	
10/15/2001	NA	NA	NA	NA	NA	NA	NA	
11/11/2002	NA	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - DRO	900,000	9,300	1,400,000	1,400,000	110,000	5,500	1,900,000	**817,829**
TPH - GRO								**TPH - GRO**
2/5/1998	NA	NA	NA	NA	NA	NA	**180,000**	
12/4/2000	NA	NA	NA	NA	NA	NA	NA	
12/5/2000	NA	NA	NA	NA	NA	NA	NA	
12/6/2000	1,500	NA	NA	NA	NA	NA	NA	
9/5/2001	NA	2,000	200,000	NA	NA	NA	NA	
9/6/2001	NA	NA	NA	20,000	2,000	2,000	NA	
10/15/2001	NA	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - GRO	1,500	2,000	200,000	20,000	2,000	2,000	180,000	**58,214**
TPH - ORO								**TPH - ORO**
12/4/2000	NA	NA	NA	NA	NA	NA	NA	
12/5/2000	NA	NA	NA	NA	NA	NA	NA	
12/6/2000	1,500	NA	NA	NA	NA	NA	NA	
9/5/2001	NA	2,000	200,000	NA	NA	NA	NA	
9/6/2001	NA	NA	NA	20,000	**16,000**	2,000	NA	
10/15/2001	NA	NA	NA	NA	NA	NA	NA	
11/11/2002	NA	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - ORO	1,500	2,000	200,000	20,000	16,000	2,000		**40,250.00**

Notes:

Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.

Non Residential Worker - above groundwater table in the area

Construction Worker - above a depth of 20 feet bgs

ug/kg - micrograms per kilogram

TPH - Total petroleum hydrocarbon

DRO - Diesel range organic

GRO - Gasoline range organic

ORO - Oil range organic

Bold indicates a detection

NA - Not analyzed

Table 3B-5(b)
Soil Constituents Average Concentrations for TPHs in Sub-area 2B: Demolished Area Construction Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	SB-15-9	SB-16-9	SB-20-15	SB-20-7	SB-21-8	SB-22-8	SB-23-8	SB-24-8	SB-25-6	SB-26-6	SB-27-8	SB-28-8	SB-29-8	SB-30-6	SB-31-6	SB-32-8	SB-33-7	SB-34-8	SB-5 5.5-7	SB-6 9.5-11	Overall Area Average (mg/kg)
TPH - DRO																					TPH - DRO
2/5/1998	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**1,900,000**	**450,000**	
12/4/2000	**470,000**	**10,000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
12/5/2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
12/6/2000	NA	NA	**99,600**	**900,000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
9/5/2001	NA	NA	NA	NA	**1,100,000**	**740,000**	**310,000**	**270,000**	**9,300**	**1,400,000**	**16,000**	**180,000**	NA	NA	NA	NA	NA	NA	NA	NA	
9/6/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**970,000**	**1,400,000**	**110,000**	**88,000**	**5,500**	**4,500**	NA	NA	
10/15/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
11/11/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - DRO	470,000	10,400	99,600	900,000	1,100,000	740,000	310,000	270,000	9,300	1,400,000	16,000	180,000	970,000	1,400,000	110,000	88,000	5,500	4,500	1,900,000	450,000	521,665
TPH - GRO																					TPH - GRO
2/5/1998	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**190,000**	**25,000**	
12/4/2000	1,500	1,500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
12/5/2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
12/6/2000	NA	NA	1,500	1,500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
9/5/2001	NA	NA	NA	NA	200,000	20,000	20,000	20,000	2,000	200,000	2,000	20,000	NA	NA	NA	NA	NA	NA	NA	NA	
9/6/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20,000	20,000	2,000	2,000	2,000	2,000	NA	NA	
10/15/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - GRO	1,500	1,500	1,500	1,500	200,000	20,000	20,000	20,000	2,000	200,000	2,000	20,000	20,000	20,000	2,000	2,000	2,000	2,000	190,000	25,000	37,150
TPH - ORO																					TPH - ORO
12/4/2000	1,500	1,500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
12/5/2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
12/6/2000	NA	NA	1,500	1,500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
9/5/2001	NA	NA	NA	NA	200,000	20,000	20,000	20,000	2,000	200,000	2,000	20,000	NA	NA	NA	NA	NA	NA	NA	NA	
9/6/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20,000	20,000	**16,000**	2,000	2,000	2,000	NA	NA	
10/15/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
11/11/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - ORO	1,500	1,500	1,500	1,500	200,000	20,000	20,000	20,000	2,000	200,000	2,000	20,000	20,000	20,000	16,000	2,000	2,000	2,000			30,666.67

Notes:
Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 3B-5(c)
Soil Constituents Average Concentrations for Metals in Sub-area 2B: Demolished Area, Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)																						
	ALUMINUM	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CALCIUM	CHROMIUM	COBALT	COPPER	IRON	LEAD	MAGNESIUM	MANGANESE	MERCURY	NICKEL	POTASSIUM	SELENIUM	SILVER	SODIUM	THALLIUM	VANADIUM	ZINC
H-19-W-A (0.5-1)	ND	ND	3,050	9,330	ND	730	ND	9,660	ND	ND	ND	2,000	ND	ND	25	ND	ND	750	3,200	ND	ND	ND	ND
H-19-S-A (0.5-1)	ND	ND	33,000	5,010	ND	20,200	ND	15,200	ND	ND	ND	2,260,000	ND	ND	21	ND	ND	500	1,910	ND	ND	ND	ND
H-19-N-A (0.5-1)	ND	ND	2,220	3,370	ND	750	ND	40,400	ND	ND	ND	22,000	ND	ND	25	ND	ND	500	2,510	ND	ND	ND	ND
H-19-E-B (0.5-1)	ND	ND	2,450	9,350	ND	740	ND	67,500	ND	ND	ND	7,000	ND	ND	25	ND	ND	650	3,250	ND	ND	ND	ND
H-19-E-A (2.5-3)	ND	ND	2,030	1,210	ND	530	ND	24,200	ND	ND	ND	4,850	ND	ND	25	ND	ND	500	1,360	ND	ND	ND	ND
H-12-E-A (0.5-1)	ND	ND	570	2,220	ND	380	ND	60,600	ND	ND	ND	2,000	ND	ND	25	ND	ND	600	3,410	ND	ND	ND	ND
H-12-E-B (2.5-3)	ND	ND	2,180	1,760	ND	150	ND	15,400	ND	ND	ND	2,000	ND	ND	25	ND	ND	500	380	ND	ND	ND	ND
H-12-S-A (0.5-1)	ND	ND	7,760	1,490	ND	960	ND	74,700	ND	ND	ND	12,900	ND	ND	25	ND	ND	600	2,730	ND	ND	ND	ND
H-12-S-B (2.5-3)	ND	ND	2,140	133,000	ND	180	ND	26,300	ND	ND	ND	2,000	ND	ND	25	ND	ND	500	290	ND	ND	ND	ND
H-12-DRAIN	ND	ND	5,840	133,000	ND	290	ND	1,410	ND	ND	ND	2,000	ND	ND	25	ND	ND	500	340	ND	ND	ND	ND
51A-1 (0-1)	4,790,000	830	9,900	46,200	362	565	14,600,000	6,150	2,660	5,650	5,550,000	8,370	39,600,000	481,000	14.2	9,070	755,000	4,020	307.5	348,000	1,575	12,100	24,400
51B-1 (0-1)	1,650,000	280.5	4,090	21,000	173	1,670	14,500,000	6,090	1,120	4,640	2,110,000	4,550	15,900,000	79,000	5	5,490	442,000	1,545	307.5	138,000	3,430	9,520	22,300
51A-1 (1-2)	21,800,000	4,500	46,300	183,000	1,400	243.5	16,400,000	19,700	9,570	17,700	30,500,000	33,100	3,790,000	747,000	33.1	25,200	1,120,000	1,545	307.5	206,000	1,575	44,200	51,800
51B-1 (1-2)	22,700,000	4,440	43,100	219,000	1,460	243.5	3,850,000	18,500	13,100	19,000	34,200,000	35,500	3,210,000	2,070,000	34.1	31,100	992,000	1,545	307.5	203,000	1,575	46,700	47,200
SB-1 2.5-4	NA	NA	10,000	210,000	NA	315	NA	19,000	NA	NA	NA	15,000	NA	NA	150	NA	NA	1,200	650	NA	NA	NA	NA
SB-1 2.5-4 D	NA	NA	3,200	160,000	NA	320	NA	18,000	NA	NA	NA	8,500	NA	NA	480	NA	NA	1,400	650	NA	NA	NA	NA
SB-2 3-4.5	NA	NA	10,000	310,000	NA	880	NA	22,000	NA	NA	NA	11,000	NA	NA	540	NA	NA	860	650	NA	NA	NA	NA
SB-4 6-7	NA	NA	20,000	130,000	NA	335	NA	21,000	NA	NA	NA	16,000	NA	NA	550	NA	NA	335	650	NA	NA	NA	NA
Average Concentration - Only Samples With Metals Detections	12,735,000	2,513	11,546	87,719	849	1,638	12,337,500	25,878	6,613	11,748	18,090,000	136,043	15,625,000	844,250	114	17,715	827,250	1,003	1,289	223,750	2,039	28,130	36,425

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 3B-5(c)
Soil Constituents Average Concentrations for Metals in Sub-area 2B: Demolished Area, Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)																						
	ALUMINUM	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CALCIUM	CHROMIUM	COBALT	COPPER	IRON	LEAD	MAGNESIUM	MANGANESE	MERCURY	NICKEL	POTASSIUM	SELENIUM	SILVER	SODIUM	Thallium	VANADIUM	ZINC
H-19-W-A (0.5-1)	ND	ND	3,050	9,330	ND	730	ND	9,660	ND	ND	ND	2,000	ND	ND	25	ND	ND	750	3,200	ND	ND	ND	ND
H-19-S-A (0.5-1)	ND	ND	33,000	5,010	ND	20,200	ND	15,200	ND	ND	ND	2,260,000	ND	ND	21	ND	ND	500	1,910	ND	ND	ND	ND
H-19-N-A (0.5-1)	ND	ND	2,220	3,370	ND	750	ND	40,400	ND	ND	ND	22,000	ND	ND	25	ND	ND	500	2,510	ND	ND	ND	ND
H-19-E-B (0.5-1)	ND	ND	2,450	9,350	ND	740	ND	67,500	ND	ND	ND	7,000	ND	ND	25	ND	ND	650	3,250	ND	ND	ND	ND
H-19-E-A (2.5-3)	ND	ND	2,030	1,210	ND	530	ND	24,200	ND	ND	ND	4,850	ND	ND	25	ND	ND	500	1,360	ND	ND	ND	ND
H-12-E-A (0.5-1)	ND	ND	570	2,220	ND	380	ND	60,600	ND	ND	ND	2,000	ND	ND	25	ND	ND	600	3,410	ND	ND	ND	ND
H-12-E-B (2.5-3)	ND	ND	2,180	1,760	ND	150	ND	15,400	ND	ND	ND	2,000	ND	ND	25	ND	ND	500	380	ND	ND	ND	ND
H-12-S-A (0.5-1)	ND	ND	7,760	1,490	ND	960	ND	74,400	ND	ND	ND	12,900	ND	ND	25	ND	ND	600	2,730	ND	ND	ND	ND
H-12-S-B (2.5-3)	ND	ND	2,140	133,000	ND	180	ND	26,300	ND	ND	ND	2,000	ND	ND	25	ND	ND	500	290	ND	ND	ND	ND
H-12-DRAIN	ND	ND	5,840	133,000	ND	290	ND	1,410	ND	ND	ND	2,000	ND	ND	25	ND	ND	500	340	ND	ND	ND	ND
51A-1 (0-1)	4,790,000	830	9,900	46,200	362	565	14,600,000	6,150	2,660	5,650	5,550,000	8,370	39,600,000	481,000	14.2	9,070	755,000	4,020	307.5	348,000	1,575	12,100	24,400
51B-1 (0-1)	1,650,000	280.5	4,090	21,000	173	1,670	14,500,000	6,090	1,120	4,640	2,110,000	4,550	15,900,000	79,000	5	5,490	442,000	1,545	307.5	138,000	3,430	9,520	22,300
51A-1 (1-2)	21,800,000	4,500	46,300	183,000	1,400	243.5	16,400,000	19,700	9,570	17,700	30,500,000	33,100	3,790,000	747,000	33.1	25,200	1,120,000	1,545	307.5	206,000	1,575	44,200	51,800
51B-1 (1-2)	22,700,000	4,440	43,100	219,000	1,460	243.5	3,850,000	18,500	13,100	19,000	34,200,000	35,500	3,210,000	2,070,000	34.1	31,100	992,000	1,545	307.5	283,000	1,575	46,700	47,200
SB-1 12-13	NA	NA	20,000	100,000	NA	650	NA	21,000	NA	NA	NA	13,000	NA	NA	50	NA	NA	1,000	650	NA	NA	NA	NA
SB-1 16-17	NA	NA	15,000	110,000	NA	340	NA	21,000	NA	NA	NA	11,000	NA	NA	560	NA	NA	340	700	NA	NA	NA	NA
SB-1 2.5-4	NA	NA	10,000	210,000	NA	315	NA	19,000	NA	NA	NA	15,000	NA	NA	150	NA	NA	1,200	650	NA	NA	NA	NA
SB-1 2.5-4 D	NA	NA	3,200	160,000	NA	320	NA	18,000	NA	NA	NA	8,500	NA	NA	480	NA	NA	1,400	650	NA	NA	NA	NA
SB-2 11-12.5	NA	NA	11,000	80,000	NA	315	NA	12,000	NA	NA	NA	11,000	NA	NA	520	NA	NA	315	650	NA	NA	NA	NA
SB-2 3-4.5	NA	NA	10,000	310,000	NA	880	NA	22,000	NA	NA	NA	11,000	NA	NA	540	NA	NA	860	650	NA	NA	NA	NA
SB-3 10.5-11.5	NA	NA	3,300	170,000	NA	330	NA	14,000	NA	NA	NA	8,900	NA	NA	530	NA	NA	330	650	NA	NA	NA	NA
SB-4 11.5-13.5	NA	NA	3,600	79,000	NA	360	NA	13,000	NA	NA	NA	9,800	NA	NA	550	NA	NA	720	700	NA	NA	NA	NA
SB-4 14-16	NA	NA	9,700	86,000	NA	375	NA	13,000	NA	NA	NA	7,500	NA	NA	550	NA	NA	370	750	NA	NA	NA	NA
SB-4 6-7	NA	NA	20,000	130,000	NA	335	NA	21,000	NA	NA	NA	16,000	NA	NA	550	NA	NA	335	650	NA	NA	NA	NA
SB-5 14-16	NA	NA	3,800	82,000	NA	380	NA	12,000	NA	NA	NA	9,000	NA	NA	50	NA	NA	1,600	750	NA	NA	NA	NA
Average Concentration - Only Samples With Metals Detections	12,735,000	2,513	10,969	91,438	849	1,289	12,337,500	22,860	6,613	11,748	18,090,000	100,759	15,625,000	844,250	194	17,715	827,250	909	1,122	223,750	2,039	28,130	36,425

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 3C-5(a)
Soil Constituents Average Concentrations for VOCs in Sub-area 2C:
Demolished Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)				
	BENZENE	ETHYLBENZENE	METHYLENE CHLORIDE	TOLUENE	XYLENES, TOTAL
Non- Residential Worker					
Average Concentration - Only Samples With VOC Detections					
Construction Worker					
B48E1-8	2.5	2.5	5.8	2.5	2.5
B48S1-6	307	227	NA	3000	829
B48S3-10	98	346	NA	52	254
B48S5-6	57	25	NA	354	670
B48S7-7	25	25	NA	76	273
B48S8-7	125	408	NA	1090	461
Average Concentration - Only Samples With VOC Detections	**102.42**	**172.25**	**5.8**	**762.42**	**414.92**

Notes:
ug/kg - micorgrams per kilogram
Groundwater table is at a depth of 5 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
VOCs - Volatile Organic Compounds
NA - Not Analyzed
Bold indicates a detection

Table 3C-5(b)
Soil Constituents Average Concentrations for TPHs in
Sub-area 2C: Demolished Area
Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B48S11-3	Overall Area Average (ug/kg)
TPH - DRO		**TPH - DRO**
11/14/2002	NA	
11/15/2002	NA	
11/19/2002	NA	
11/20/2002	NA	
11/21/2002	NA	
6/30/2003	**1,330,000**	
7/23/2003	NA	
AVERAGE TPH - DRO	1,330,000	**1,330,000**
TPH - GRO		**TPH - GRO**
11/14/2002	NA	
11/15/2002	NA	
11/19/2002	NA	
11/20/2002	NA	
6/30/2003	**13,000**	
7/23/2003	NA	
AVERAGE TPH - GRO	13,000	**13,000**
TPH - ORO		**TPH - ORO**
11/14/2002	NA	
11/15/2002	NA	
11/19/2002	NA	
11/20/2002	NA	
6/30/2003	**34,000**	
7/23/2003	NA	
AVERAGE TPH - ORO	34,000	**34,000**

Notes:
Groundwater table is at a depth of 5 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 3C-5(b)
Soil Constituents Average Concentrations for TPHs in Sub-area 2C: Demolished Area Construction Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B48S10-7	B48S11-3	B48S1-6	B48S3-10	B48S5-6	B48S7-7	B48S8-7	B48S9-8	Overall Area Average (ug/kg)
TPH - DRO									**TPH - DRO**
11/14/2002	NA	NA	2500	NA	NA	NA	NA	NA	
11/15/2002	NA	NA	NA	2500	NA	NA	NA	NA	
11/19/2002	NA	NA	NA	NA	2,500	NA	NA	NA	
11/20/2002	NA	NA	NA	NA	NA	2,500	2,500	NA	
11/21/2002	**38,000**	NA	NA	NA	NA	NA	NA	**38,000**	
6/30/2003	NA	**1,330,000**	NA	NA	NA	NA	NA	NA	
7/23/2003	NA	NA	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - DRO	38,000	1,330,000	2,500	2,500	2,500	2,500	2,500	38,000	**177,313**
TPH - GRO									**TPH - GRO**
11/14/2002	NA	NA	**250,000**	NA	NA	NA	NA	NA	
11/15/2002	NA	NA	NA	**83,000**	NA	NA	NA	NA	
11/19/2002	NA	NA	NA	NA	**66,000**	NA	NA	NA	
11/20/2002	NA	NA	NA	NA	NA	**38,000**	**133,000**	NA	
6/30/2003	NA	**13,000**	NA	NA	NA	NA	NA	NA	
7/23/2003	NA	NA	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - GRO		13,000	250,000	83,000	66,000	38,000	133,000		**97,167**
TPH - ORO									**TPH - ORO**
11/14/2002	NA	NA	47,000	NA	NA	NA	NA	NA	
11/15/2002	NA	NA	NA	2,500	NA	NA	NA	NA	
11/19/2002	NA	NA	NA	NA	2,500	NA	NA	NA	
11/20/2002	NA	NA	NA	NA	NA	2,500	2,500	NA	
6/30/2003	NA	**34,000**	NA	NA	NA	NA	NA	NA	
7/23/2003	NA	NA	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - ORO		34,000	47,000	2,500	2,500	2,500	2,500		**15,167**

Notes:

Groundwater table is at a depth of 5 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon

DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 3C-5(c)

Soil Constituents Average Concentrations for Metals in Sub-area 2C Demolished Area Non-Residential Worker and Construction Worker Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)
	LEAD
B48E1-8	8,210
Average Concentration - Only Samples With Metals Detections	8,210

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 5 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 3-6
Groundwater Samples Used in Average Concentration Calculations in Area 2: Demolished Area
Boeing Tract 1, St. Louis, Missouri

	Volatile Organic Compounds	Total Petroleum Hydrocarbons	Polynuclear Aromatic Hydrocarbons	Polychlorinated Biphenyls	Metals
2A	B51W1W	B51W2W			B51W3W
	B51W2W	B51W3W			B51W4W
	B51W4W				MW-A8W
	B-7				
2B	B48N1W	B48N1W			TP-1
	MW-10S	MW-10S			TP-9
	MW-11S	MW-11S			
	MW-6S	MW-6S			
	MW-7S	MW-7S			
	MW-8S	MW-8S			
	MW-9S	MW-9S			
	SB13W	SB17W			
	SB18W	TP-1			
	SB20W	TP-10			
	TP-1	TP-11			
	TP-10	TP-16			
	TP-11	TP-17			
	TP-16	TP-18			
	TP-17	TP-19			
	TP-18	TP-2			
	TP-19	TP-20			
	TP-2	TP-3			
	TP-20	TP-22			
	TP-21	TP-23			
	TP-22	TP-24			
	TP-23	TP-25			
	TP-24	TP-4			
	TP-25	TP-12			
	TP-3	TP-13			
	TP-4	TP-15			
	TP-5	TP-14			
	TP-6	TP-5			
	TP-8	TP-6			
		TP-7			
		TP-8			
		TP-9			
2C	B48S1W	B48E1W			B48E1W
	B48S2W	B48S10W			
	B48S3W	B48S2W			
	B48S5W	B48S3W			
	B48S7W	B48S5W			
	B48S8W	B48S6W			
	B48S9W	B48S7W			
	MW-A13W	B48S9W			
		MW-A13W			

Note:
- analysis type not performed

Table 3A-7(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 2A: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)						
	BENZENE	ETHYLBENZENE	METHYL TERT-BUTYL ETHE	METHYLENE CHLORIDE	TETRACHLOROETHENE	TOLUENE	XYLENES, TOTAL
B51W1W	1.75	1.75	2.5	1	**3.5**	1.75	2.5
B51W2W	**60.9**	2.5	2.5	NA	NA	**60.8**	**179**
B51W3W	2	2.5	3.67	**6.05**	2.50	2.5	2.5
B51W4W	1.75	1.75	3	10	**4.8**	1.75	2.5
B-7	**817**	**130**	**20**	NA	NA	**33**	**140**
Average Concentration - Only Samples With VOC Detections	**220.35**	**34**	**7**	**5.5**	**4.15**	**24.325**	**81**

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed
No VOCs except methylene chloride detected in the sample
Bold indicates a detection

Table 3A-7(b)
Groundwater Constituents Average Concentrations for TPHs in Sub-area 2A: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B51W2W	B51W2W - 2004	B51W3W	Overall Area Average (ug/l)
TPH-DRO				**TPH-DRO**
1/10/2002	NA	NA	NA	
7/2/2003	**190,000**	NA	NA	
7/23/2003	NA	NA	NA	
7/24/2003	NA	NA	**309**	
4/30/2004	NA	250	NA	
AVERAGE	190,000		309	**95,155**
TPH-GRO				**TPH-GRO**
7/2/2003	**1,110,000**	NA	NA	
7/23/2003	NA	NA	NA	
7/24/2003	NA	NA	500	
4/30/2004	NA	250	NA	
AVERAGE	1,110,000		500	**555,250**
TPH-ORO				**TPH-ORO**
7/2/2003	500	NA	NA	
7/23/2003	NA	NA	NA	
7/24/2003	NA	NA	75	
4/30/2004	NA	250	NA	
AVERAGE	500		75	**288**

Notes:
ug/l - micrograms per liter
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 3A-7(c)
Groundwater Constituents Average Concentrations for Metals in
Sub-area 2A: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/l)				
	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD
B51W3W	NA	NA	NA	NA	22
B51W4W	NA	NA	NA	NA	22
MW-A8W	**46.5**	**765**	**8.9**	**39.5**	**65.5**
Average Concentration - Only Samples With Metals Detections	**46.5**	**765**	**8.9**	**39.5**	**36.5**

Notes:
ug/l - micrograms per liter
NA - Not Analyzed
Bold indicates a detection

Table 3B-7(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 2B: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)																								
	1,1,1-TRICHLOROETHANE	1,1-DICHLOROETHANE	1,1-DICHLOROETHENE	1,2,3-TRIMETHYLBENZENE	1,2,4-TRIMETHYLBENZENE	ACETONE	BENZENE	CIS-1,2-DICHLOROETHENE	ETHYLBENZENE	ISOPROPYL BENZENE	METHYL ISOBUTYL KETONE	METHYL TERT-BUTYL ETHER	METHYLENE CHLORIDE	NAPHTHALENE	N-BUTYLBENZENE	N-PROPYLBENZENE	P-ISOPROPYLTOLUENE	SEC-BUTYLBENZENE	TERT-BUTYLBENZENE	TETRACHLOROETHENE	TOLUENE	TRANS-1,2-DICHLOROETHENE	TRICHLOROETHENE	TRICHLOROFLUOROMETHANE	VINYL CHLORIDE	XYLENES, TOTAL
B48N1W	1	1	1	0.5	1	25	1	26.375	1	1	25	0.5	2.5	2.5	1	1	1	1	1	11.475	2.5	1	3.125	1	1	1.5
MW-10S	72.14	72.14	72.14	0.50	72.14	3607.14	63.16	72.14	63.16	72.46	3607.14	63.44	360.71	217.00	515.00	73.61	72.70	302.66	72.14	72.14	315.41	72.14	72.14	72.14	72.14	189.47
MW-11S	0.5	0.5	0.5	28	0.5	25	0.48	2.45	0.52	0.71	25	0.68	2.5	1.8	1.75	0.81	0.75	1.13	0.5	3.35	2.11	0.5	1.34	0.5	0.5	1.43182
MW-6S	1.71	1.71	2.69	0.50	1.58	70.43	1.71	582.87	1.71	1.58	68.57	1.58	7.57	3.92	1.58	1.58	1.58	1.58	1.58	1.71	4.29	9.40	70.64	1.58	153.36	4.43
MW-7S	1089.29	1089.29	1089.29	250.00	1089.29	54428.57	1089.29	9,829	1089.29	1089.29	54428.57	1089.29	5442.86	1871.43	1089.29	1089.29	1089.29	1089.29	1089.29	136,142.86	5300.00	1089.29	15,657.14	1089.29	1089.29	3267.86
MW-8S	0.5	0.5	0.5	0.5	0.5	25	0.49	0.64	0.49	0.5	25	1.06	2.53	1.79	0.5	0.5	0.5	0.5	0.5	4.81	2.26	0.5	0.63	0.5	0.5	1.45833
MW-9S	4.86	4.99	4.86	0.50	4.95	241.07	9.19	174.68	4.76	7.39	241.07	4.70	24.11	16.17	6.25	7.97	6.09	6.53	5.34	495.93	22.45	4.86	308.48	4.86	7.00	14.57
SB13W	2.5	2.5	2.5	NA	NA	10	2.5	79	2.5	NA	10	NA	2.5	NA	NA	NA	NA	NA	NA	14	27	2.5	6.6	NA	2.5	10
SB18W	1250	1250	1250	NA	1250	2500	1250	2400	1250	1250	2500	2500	1250	1250	1250	1250	NA	1250	1250	86,000	1250	1250	920	2500	2500	1250
SB20W	2.5	2.5	2.5	NA	2.5	5	7	2.5	2.5	14	5	5	2.5	2.5	19	26	NA	10	2.5	2.5	2.5	2.5	2.5	5	5	2.5
TP-1	254.65	255.5	340	NA	500	12,527.5	260.5	77,500	267.5	500	12,512.5	500	1,254.25	500	500	500	500	500	500	160,000	6500	325	8,350	500	12750	830
TP-10	125	125	125	NA	125	6000	125	2,700	125	125	6000	125	600	625	125	125	125	125	125	10,000	600	125	1,100	125	125	375
TP-11	125	125	125	NA	125	6000	125	9,300	125	125	6000	125	600	625	125	125	125	125	125	4,300	600	125	860	125	1,600	375
TP-16	25	25	25	NA	25	1250	25	25	25	120	1250	25	125	25	570	200	25	410	25	25	125	25	25	25	25	75
TP-17	5	5	5	NA	5	250	2627.5	69.5	5	5	250	10	25	5	5	5	5	5	5	230	25	5	10	5	5	15
TP-18	0.5	0.5	0.5	NA	0.5	25	0.5	12	0.5	0.5	25	0.5	2.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2.5	1.6	0.5	0.5	1	1.5
TP-19	0.5	0.5	0.5	NA	0.5	25	0.5	3.55	0.5	0.5	25	0.5	2.5	0.5	0.5	0.5	0.5	0.5	0.5	3.55	2.5	0.5	1.35	0.5	0.5	1.5
TP-2	206.63	206.63	208.19	250.00	235.79	10285.00	206.63	6,250.06	222.25	235.79	10285.13	235.79	1028.75	950.07	235.91	235.79	235.79	235.79	235.79	19,800.06	1,029.10	210.06	4,112.56	235.79	212.56	619.25
TP-20	1.5	3.3	1.5	NA	0.5	25	1.5	1.5	1.5	0.5	25	1.5	2.5	0.5	0.5	0.5	0.5	0.5	0.5	1.5	2.5	6.75	1.5	0.5	42.55	2
TP-21	2.5	2.5	2.5	NA	NA	NA	2.5	147.95	2.5	NA	NA	2.5	2.5	NA	NA	NA	NA	NA	NA	2.5	2.5	2.5	2.5	NA	28.9	2.5
TP-22	2.5	2.5	2.5	NA	NA	NA	2.5	581.2	2.5	NA	NA	2.5	2.5	NA	NA	NA	NA	NA	NA	1,540.87	2.5	5.3	139.9	NA	108.1	2.5
TP-23	2.5	2.5	2.5	NA	NA	NA	2.5	2.5	6.8	NA	NA	2.5	2.5	NA	NA	NA	NA	NA	NA	2.5	9.6	2.5	2.5	NA	2.5	195.8
TP-24	0.5	0.5	0.5	NA	0.5	25	0.5	0.5	0.5	0.5	25	0.5	2.5	0.5	0.5	0.5	0.5	28.5	0.5	0.5	2.5	0.5	0.5	0.5	0.5	1.5
TP-25	0.5	0.5	0.5	NA	0.5	25	0.5	3.1	0.5	0.5	25	0.5	2.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2.5	0.5	0.5	0.5	0.5	1.5
TP-3	18.73	18.73	18.73	0.50	48.46	925.45	76.00	186.91	32.41	22.26	925.45	155.35	92.73	130.25	24.46	22.03	20.82	24.19	20.35	659.64	179.09	18.73	923.27	20.35	18.95	151.18
TP-4	1.22	1.22	1.22	0.50	0.86	38.89	1.13	60.02	1.82	0.86	34.44	1.06	3.89	5.09	0.86	0.86	0.86	0.86	0.86	3,489.44	9.95	2.18	63.18	1.14	4.60	5.25
TP-5	1000	1000	1000	NA	1000	34375	1000	20,150	1000	1000	34375	1312.5	3687.5	1500	1000	1000	916.67	1000	1000	132,250	2500	1000	24,725	1312.5	2,162.5	2687.5
TP-6	61.50	61.50	61.50	0.50	61.58	3075.00	61.50	61.50	61.50	61.50	3075.00	61.50	307.50	285.28	61.67	61.50	61.98	62.06	61.50	61.50	307.50	61.50	378.32	61.50	61.50	184.50
TP-8	0.5	0.5	0.5	NA	0.5	25	0.5	200	0.5	0.5	25	0.5	2.5	2.5	0.5	0.5	0.5	0.5	0.5	4.4	2.5	4.2	0.5	0.5	120	1.5
Average Concentration - Only Samples With VOC Detections	146.87	146.96	149.90	48.36	182.09	5,223.62	239.47	4,497.40	148.18	185.41	5,222.80	222.46	511.89	320.91	221.41	189.16	138.74	207.26	180.97	19,114.53	649.44	150.16	1,991.02	243.57	727.62	354.18

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed
Bold indicates a detection

Tab[illegible])
Groundwater Constituents Average Concentr[illegible]or TPHs in Sub-area 2B: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B48N1W	MW-10S	MW-11S	MW-4S	MW-7S	MW-8S	MW-9S	SB17W	TP-1	TP-10	TP-11	TP-12	TP-13	TP-14	TP-15	TP-16
TPH-DRO																
07/19/2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
12/06/2000	NA	NA	NA	NA	NA	NA	NA	64	NA	NA	NA	NA	NA	NA	NA	NA
02/19/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
02/20/2001	NA	950	50	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
02/21/2001	NA	NA	NA	NA	NA	NA	2,400	NA	NA	NA	NA	NA	NA	NA	NA	NA
02/22/2001	NA	NA	NA	50	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
02/23/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
02/28/2001	NA	NA	NA	NA	NA	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	NA
07/25/2001	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
07/26/2001	NA	NA	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
07/27/2001	NA	7,600	NA	50	50	NA	6,300	NA	NA	NA	NA	NA	NA	NA	NA	NA
09/05/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	14,000	NA	50	NA	NA	NA
09/06/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	NA	110,000	2,200,000	2,100,000
10/15/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/17/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/26/2001	NA	NA	NA	310	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/29/2001	NA	300,000	50	NA	NA	150	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/30/2001	NA	NA	NA	NA	50	NA	6,300	NA	NA	NA	NA	NA	NA	NA	NA	NA
12/13/2001	NA	NA	NA	NA	230	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
12/17/2001	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
12/18/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
12/19/2001	NA	330,000	NA	300	NA	NA	6,700	NA	NA	NA	NA	NA	NA	NA	NA	NA
03/05/2002	NA	74,000	50	NA	50	NA	5,300	NA	NA	NA	NA	NA	NA	NA	NA	NA
03/07/2002	NA	NA	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
03/08/2002	NA	NA	NA	190	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
05/30/2002	NA	NA	NA	50	50	50	5,400	NA	NA	NA	NA	NA	NA	NA	NA	NA
06/03/2002	NA	140,000	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
08/08/2002	NA	NA	NA	NA	NA	110	2,900	NA	NA	NA	NA	NA	NA	NA	NA	NA
08/13/2002	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11/11/2002	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
12/05/2002	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
12/09/2002	NA	NA	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
12/11/2002	110	NA	NA	NA	NA	NA	3,500	NA	NA	NA	NA	NA	NA	NA	NA	NA
03/12/2003	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
03/18/2003	NA	NA	NA	NA	NA	130	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
03/19/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
03/21/2003	480	NA	NA	NA	NA	NA	6,400	NA	NA	NA	NA	NA	NA	NA	NA	NA
06/17/2003	NA	48,000	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06/19/2003	NA	NA	NA	50	50	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06/25/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06/26/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06/27/2003	50	NA	NA	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/30/2004	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5/4/2004	NA	38,000	NA	NA	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AVERAGE	285	117,319	50	140	94	77	4,525	64	50	50	14,000	50	50	110,000	2,200,000	2,100,000

Tabl[illegible])
Groundwater Constituents Average Concentra[illegible]or TPHs in Sub-area 2B: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B48N1W	MW-10S	MW-11S	MW-6S	MW-7S	MW-8S	MW-9S	SB17W	TP-1	TP-10	TP-11	TP-12	TP-13	TP-14	TP-15	TP-16
TPH-GRO																
07/19/2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
12/06/2000	NA	NA	NA	NA	NA	NA	NA	64	NA	NA	NA	NA	NA	NA	NA	NA
02/19/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
02/20/2001	NA	50	50	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
02/21/2001	NA	NA	NA	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	NA
02/22/2001	NA	NA	NA	**650**	**45,000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
02/23/2001	NA	NA	NA	NA	NA	NA	NA	NA	**110,000**	NA	NA	NA	NA	NA	NA	NA
02/28/2001	NA	NA	NA	NA	NA	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	NA
09/05/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	2000	NA	50	NA	NA	NA
09/06/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	NA	5000	50000	50000
10/15/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/17/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06/17/2003	NA	50	**1,400**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06/19/2003	NA	NA	NA	50	**19,000**	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06/25/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06/26/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06/27/2003	50	NA	NA	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/30/2004	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5/4/2004	NA	250	NA	NA	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AVERAGE	50	117	725	850	21,417	50	50	64	55,025	50	2,000	50	50	5,000	50,000	50,000
TPH-ORO																
12/06/2000	NA	NA	NA	NA	NA	NA	NA	**344**	NA	NA	NA	NA	NA	NA	NA	NA
02/19/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
02/20/2001	NA	50	50	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
02/21/2001	NA	NA	NA	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	NA
02/22/2001	NA	NA	NA	**380**	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
02/23/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
02/28/2001	NA	NA	NA	NA	NA	NA	NA	NA	**570**	NA	NA	NA	NA	NA	NA	NA
09/05/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	**2,000**	2000	NA	**590**	NA	NA	NA
09/06/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**430**	NA	5000	50000	50000
10/15/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/17/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11/11/2002	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06/17/2003	NA	500	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06/19/2003	NA	NA	NA	**540**	**6,800**	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06/25/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06/26/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06/27/2003	**170**	NA	NA	NA	NA	NA	**2,000**	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/30/2004	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5/4/2004	NA	250	NA	NA	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AVERAGE	335	153	50	460	2,367	50	1,025	344	570	2,000	2,000	430	590	5,000	50,000	50,000

Notes:
ug/l - micrograms per liter
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 3B-7(b)
Groundwater Constituents Average Concentrations for TPHs in Sub-area 2B: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	TP-17	TP-18	TP-19	TP-2	TP-20	TP-22	TP-23	TP-24	TP-24 -2004	TP-25	TP-3	TP-4	TP-5	TP-6	TP-7	TP-8	TP-9	TP-9 -2004	Overall Area Average (mg/l)
TPH-DRO																			TPH-DRO
07/19/2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
12/06/2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02/19/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02/20/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02/21/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	290	NA	NA	NA	NA	NA	NA	
02/22/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02/23/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	45,000	NA	50	NA	NA	NA	NA	NA	
02/28/2001	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
07/25/2001	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	7,400	NA	NA	NA	NA	NA	NA	NA	
07/26/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	150	NA	NA	NA	NA	NA	NA	
07/27/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	NA	NA	NA	NA	NA	
09/05/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	230,000	1,000,000	50	1,100,000	NA	
09/06/2001	12,400	50	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
10/15/2001	NA	NA	NA	NA	50	NA	NA	325,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
10/17/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	
10/26/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
10/29/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6,900	NA	NA	NA	NA	NA	NA	NA	
10/30/2001	NA	NA	NA	190	NA	NA	NA	NA	NA	NA	NA	210	50	NA	NA	NA	NA	NA	
12/13/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
12/17/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
12/18/2001	NA	NA	NA	180	NA	NA	NA	NA	NA	NA	NA	230	NA	20,000	NA	NA	NA	NA	
12/19/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15,000	NA	NA	NA	NA	NA	NA	NA	
03/05/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8,800	NA	NA	4,300	NA	NA	NA	NA	
03/07/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
03/08/2002	NA	NA	NA	160	NA	NA	NA	NA	NA	NA	NA	120	NA	NA	NA	NA	NA	NA	
05/30/2002	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	9,800	NA	NA	NA	NA	NA	NA	NA	
06/03/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	NA	2,800	NA	NA	NA	NA	
08/08/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7,500	NA	NA	NA	NA	NA	NA	NA	
08/13/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2,700	NA	NA	NA	NA	
11/11/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
12/05/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2,500	NA	NA	NA	NA	
12/09/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9,100	NA	NA	NA	NA	NA	NA	NA	
12/11/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
03/12/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
03/18/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,600	NA	NA	NA	NA	
03/19/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	13,000	NA	NA	NA	NA	NA	NA	NA	
03/21/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
06/17/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	NA	NA	NA	NA	
06/19/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
06/25/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
06/26/2003	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	
06/27/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	
4/30/2004	NA	NA	NA	NA	NA	NA	NA	NA	1,400	NA	NA	NA	NA	NA	NA	NA	NA	NA	
5/4/2004	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7,500	
AVERAGE	12,400	50	50	104	50			325,000	1,400	50	12,255	157	50	32,954	1,000,000	50	1,100,000	7,500	219,988

Table 3B-7(b)
Groundwater Constituents A[illegible] Concentrations for TPHs in Sub-area 2B: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	TP-17	TP-18	TP-19	TP-2	TP-20	TP-22	TP-23	TP-24	TP-24 -2004	TP-25	TP-3	TP-4	TP-5	TP-6	TP-7	TP-8	TP-9	TP-9 -2004	Overall Area Average (ug/l)
TPH-GRO																			TPH-GRO
07/19/2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
12/06/2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02/19/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02/20/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02/21/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	
02/22/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02/23/2001	NA	NA	NA	**10,000**	NA	NA	NA	NA	NA	NA	**21,000**	NA	**27,000**	NA	NA	NA	NA	NA	
02/28/2001	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
09/05/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5000	50000	50	50000	NA	
09/06/2001	500	50	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
10/15/2001	NA	NA	NA	NA	500	500	500	5000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
10/17/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	
06/17/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	NA	NA	NA	NA	
06/19/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
06/25/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
06/26/2003	NA	NA	NA	**20,000**	NA	NA	NA	NA	NA	NA	NA	**1,600**	NA	NA	NA	NA	NA	NA	
06/27/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**420**	NA	NA	NA	NA	NA	NA	NA	
4/30/2004	NA	NA	NA	NA	NA	NA	NA	NA	250	NA	NN	NA	NA	NA	NA	NA	NA	NA	
5/4/2004	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**670**	
AVERAGE	500	50	50	10,017	500	500	500	5,000	250	50	10,710	425	27,000	2,525	50,000	50	50,000	670	10,133
TPH-ORO																			TPH-ORO
12/06/2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02/19/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02/20/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02/21/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	
02/22/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02/23/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	500	NA	50	NA	NA	NA	NA	NA	
02/28/2001	NA	NA	NA	**160**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
09/05/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5000	50000	**1,400**	50000	NA	
09/06/2001	**2,400**	**140**	**160**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
10/15/2001	NA	NA	NA	NA	**570**	**24,472**	**212,199**	**65,000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
10/17/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	**350**	NA	NA	NA	NA	NA	NA	NA	NA	
11/11/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
06/17/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**1,300**	NA	NA	NA	NA	
06/19/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
06/25/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
06/26/2003	NA	NA	NA	**2,000**	NA	NA	NA	NA	NA	NA	NA	**130**	NA	NA	NA	NA	NA	NA	
06/27/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**5,900**	NA	NA	NA	NA	NA	NA	NA	
4/30/2004	NA	NA	NA	NA	NA	NA	NA	NA	**7,800**	NA	NA	NA	NA	NA	NA	NA	NA	NA	
5/4/2004	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	250	
AVERAGE	2,400	140	160	1,080	570	24,472	212,199	65,000	7,800	350	3,200	90	50	3,150	50,000	1,400	50,000	250	15,814

Notes:
ug/l - micrograms per liter
TPH - Total petroleum hydroc
DRO - Diesel range organic
GRO - Gasoline range organic

Table 3B-7(c)
Groundwater Constituents Average Concentrations for Metals in Sub-area 2B: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/l)					
	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	SELENIUM
TP-1	3.7	440	2.5	5	4.2	2.5
TP-9	130	1600	5.4	19	6.7	13
Average Concentration - Only Samples With Metals Detections	**66.85**	**1020**	**3.95**	**12**	**5.45**	**7.75**

Notes:
ug/l - micrograms per liter
NA - Not Analyzed
Bold indicates a detection

Table 3C-7(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 2C: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)				
	BENZENE	ETHYLBENZENE	METHYL TERT-BUTYL ETHER	TOLUENE	XYLENES, TOTAL
B48S1W	**569**	2.5	2.5	2.5	2.5
B48S2W	**921**	**24**	**9.9**	2.5	2.5
B48S3W	**14.6**	2.5	2.5	**16.1**	2.5
B48S5W	**24.8**	**5.3**	2.5	**36**	**17.1**
B48S7W	**25.7**	2.5	2.5	**59.6**	**23.6**
B48S8W	**22.2**	2.5	2.5	2.5	2.5
B48S9W	**0.61**	0.25	NA	2.5	0.75
MW-A13W	**44**	**180**	**59**	12.5	**15**
Average Concentration - Only Samples With VOC Detections	**202.739**	**27.444**	**11.629**	**16.775**	**8.3063**

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed
Bold indicates a detection

Table 3C-7(b)
Groundwater Constituents Average Concentrations for TPHs in Sub-area 2C: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B48E1W	B48S10W	B48S2W	B48S3W	B48S5W	B48S6W	B48S7W	B48S9W	MW-A13W	Overall Area Average (ug/l)
TPH-DRO										**TPH-DRO**
11/14/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	
11/15/2002	NA	NA	500	500	NA	NA	NA	NA	NA	
11/19/2002	NA	NA	NA	NA	500	500	NA	NA	NA	
11/20/2002	NA	NA	NA	NA	NA	NA	500	NA	NA	
11/21/2002	NA	**180**	NA	NA	NA	NA	NA	**1,000**	NA	
7/1/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/23/2003	**420**	NA	NA	NA	NA	NA	NA	NA	NA	
AVERAGE	420	180	500	500	500	500	500	1,000		513
TPH-GRO										**TPH-GRO**
11/14/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	
11/15/2002	NA	NA	**1,160**	**1,746**	NA	NA	NA	NA	NA	
11/19/2002	NA	NA	NA	NA	**301,200**	500	NA	NA	NA	
11/20/2002	NA	NA	NA	NA	NA	NA	**207,200**	NA	NA	
3/20/2003	NA	NA	NA	NA	NA	NA	NA	NA	**3,300**	
7/1/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/23/2003	500	NA	NA	NA	NA	NA	NA	NA	NA	
AVERAGE	500		1,160	1,746	301,200	500	207,200		3,300	73,658
TPH-ORO										**TPH-ORO**
11/14/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	
11/15/2002	NA	NA	500	500	NA	NA	NA	NA	NA	
11/19/2002	NA	NA	NA	NA	500	500	NA	NA	NA	
11/20/2002	NA	NA	NA	NA	NA	NA	500	NA	NA	
7/1/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/23/2003	75	NA	NA	NA	NA	NA	NA	NA	NA	
AVERAGE	75		500	500	500	500	500			429

Notes:
ug/l - micrograms per liter
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 3C-7(c)
Groundwater Constituents Average Concentrations for Metals in Sub-area 2C: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/l)
	LEAD
B48E1W	22
Average Concentration - Only Samples With Metals Detections	22

Notes:
ug/l - micrograms per liter
NA - Not Analyzed
Bold indicates a detection

Table 3-8
Historical Groundwater Data for Area 2: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Well	Sub-area	Sampling Date	Benzene (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Xylenes (ug/L)
MW-A19	2A	1/24/1990	6400	1540	26000	6000
		6/5/1990	90	20	10	25
		6/20/1991	85	7	<5	17
		7/6/1993	14	2	4	55
		4/26/1994	12	<5	18	23
		1/13/1995	11	<5	<5	4
		12/26/1996	11	<5	<5	<15
MW-A7	2A	6/5/1990	<5	<5	<5	<15
		7/6/1993	<5	<5	<5	<15
MW-A16	2A	1/24/1990	15	11	100	38
		6/5/1990	<5	<5	<5	<15
		6/20/1991	<5	<5	<5	<15
		7/6/1993	<5	<5	<5	<15
		4/26/1994	<5	<5	<5	<15
		1/13/1995	<5	<5	<5	<15
		12/27/1996	<5	<5	<5	<15
		7/14/1997	<5	<5	1	<15
MW-A10	2C	6/5/1990	1200	140	35	900
		1/10/1991	1500	60	90	120
		6/20/1991	<5	<5	<5	<15
		7/6/1993	62	<5	<5	<15
		4/26/1994	<25	<25	<25	<75
		1/13/1995	11	<5	<5	4
		12/27/1996	11	<5	<5	<15
MW-A12	2C	1/24/1990	5000	1600	8000	11800
		1/10/1991	80	15	<5	<15
		7/6/1993	<5	<5	1	<15
		4/26/1994	<5	<5	<5	<15
		1/13/1995	<5	<5	<5	<15
		12/27/1996	<5	<5	<5	<15
		7/14/1997	8	<5	<5	<15
MW-A13	2C	6/5/1990	26000	60	20	20
		1/10/1991	12000	<5	120	<150
		6/20/1991	<5	<5	<5	<15
		7/6/1993	5700	42	<5	<15
		4/26/1994	3810	<25	<25	<75
		1/13/1995	<5	160	<5	6
		12/27/1996	2080	<5	<5	<15
		7/14/1997	1040	27	4	<15
		1/29/1998	3200	33	<5	<15
		1/5/1999	125	6	<5	<5
		6/13/2000	79	<5	<5	<15
		4/30/2002	<2	<5	<5	<5
		3/20/2003	44	<25	180	15

Notes:
< Less than detection limit shown
ug/L: micrograms per liter

Table 3-9
Historic Free Product Thicknesses for Area 2: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Sub-area 2A				Sub-area 2B											
MW-A19 (RW-A19)				MW-9S				MW-10S				TP-6			
Date	Product Thickness (ft)	Depth to GW (ft)	Screened Interval (ft)	Date	Product Thickness (ft)	Depth to GW (ft)	Screened Interval (ft)	Date	Product Thickness (ft)	Depth to GW (ft)	Screened Interval (ft)	Date	Product Thickness (ft)	Depth to GW (ft)	Screened Interval (ft)
9/7/1989	0.02		2.5-12	12/20/2000	Installed			12/12/2000	Installed			9/5/2001	Installed		
9/26/1989	<0.01		2.5-12	2/21/2001	0.00	4.79	6-16	2/20/2001	Sheen	6.73	5-15	9/5/2001	Sheen	6.65	6-16
1/14/1990	0.00		2.5-12	7/27/2001	0.00	4.29	6-16	7/27/2001	Sheen	7.31	5-15	12/18/2001	Sheen	5.63	6-16
2/0/1990	Trace		2.5-12	10/30/2001	Sheen	4.37	6-16	10/29/2001	Sheen	6.90	5-15	3/5/2002	0.00	5.99	6-16
				12/19/2001	0.00	3.91	6-16	12/19/2001	Sheen	6.71	5-15	6/3/2002	0.00	5.44	6-16
8/20/1993	Inaccessible		2.5-12	3/5/2002	0.00	4.75	6-16	3/5/2002	0.02	6.50	5-15	8/13/2002	0.00	6.25	6-16
8/27/1993	Inaccessible		2.5-12	5/30/2002	0.00	4.06	6-16	6/3/2002	Sheen	6:61	5-15	12/5/2002	Sheen	7.41	6-16
9/9/1993	0.00	3.41	2.5-12	8/8/2002	0.00	4.98	6-16	6/17/2003	Sheen	6.10	5-15	3/18/2003	0.00	5.30	6-16
9/16/1993	0.00	3.43	2.5-12	12/11/2002	0.00	5.06	6-16	5/4/2004	0.01	6.49	5-15	6/17/2003	0.00	4.63	6-16
9/23/1993	0.00	3.28	2.5-12	3/21/2003	Sheen	4.49	6-16								
12/27/1994	0.00	3.85	2.5-12	6/27/2003	<0.01	3.96	6-16								
11/30/1995	NA	NA	2.5-12												
12/27/1995	NA	4.29	2.5-12												
1/31/1996	NA	NA	2.5-12												
5/30/1996	NA	3.33	2.5-12												
12/26/1996	NA	4.3	2.5-12												

Note:
ft: Feet
NA: Not Available
Highlighted depths to GW above top of screened interval

Table 3-9
Historic Free Product Thicknesses for Area 2: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Sub-area 2C											
MW-A10				MW-A12				MW-A13			
Date	Product Thickness (ft)	Depth to GW (ft)	Screened Interval (ft)	Date	Product Thickness (ft)	Depth to GW (ft)	Screened Interval (ft)	Date	Product Thickness (ft)	Depth to GW (ft)	Screened Interval (ft)
9/7/1989	0.01		4.5-14.5	1/4/1990	1.13		4.5-14.5	1/4/1990	0.00		4.5-14.5
9/26/1989	<0.01		4.5-14.5	2/1/1990	0.00		4.5-14.5	2/1/1990	0.00		4.5-14.5
1/4/1990	Trace		4.5-14.5								
2/1/1990	0.00		4.5-14.58	8/11/1993	0.00	3.96	4.5-14.5	8/11/1993	0.00	5.08	4.5-14.5
				8/20/1993	0.00	4.31	4.5-14.5	8/20/1993	0.00	5.15	4.5-14.5
8/11/1993	0.03	4.74	4.5-14.5	8/27/1993	0.00	4.31	4.5-14.5	8/27/1993	0.00	5.01	4.5-14.5
8/20/1993	0.02	4.77	4.5-14.5	9/9/1993	0.00	4.34	4.5-14.5	9/9/1993	0.00	5.02	4.5-14.5
8/27/1993	0.00	4.16	4.5-14.5	9/16/1993	0.00	4.30	4.5-14.5	9/16/1993	0.00	4.98	4.5-14.5
9/9/1993	0.06	4.14	4.5-14.5	9/23/1993	0.00	3.83	4.5-14.5	9/23/1993	0.00	4.87	4.5-14.5
9/16/1993	0.02	4.14	4.5-14.5	12/27/1994	0.00	4.78	4.5-14.5	12/27/1994	0.00	5.23	4.5-14.5
9/23/1993	0.00	4.11	4.5-14.5	12/27/1994	0.00	6.49	4.5-14.5	12/27/1994	0.00	5.62	4.5-14.5
12/27/1994	0.00	4.36	4.5-14.5	1/26/1995	0.00	5.05	4.5-14.5	1/26/1995	0.00	5.22	4.5-14.5
12/27/1994	0.00	5.16	4.5-14.5	4/27/1995	0.00	4.23	4.5-14.5	4/27/1995	0.00	5.15	4.5-14.5
1/26/1995	0.00	4.34	4.5-14.5	5/25/1995	0.00	5.40	4.5-14.5	5/25/1995	0.00	4.94	4.5-14.5
4/27/1995	0.00	4.50	4.5-14.5	6/29/1995	0.00	4.22	4.5-14.5	6/29/1995	0.00	4.92	4.5-14.5
5/25/1995	0.00	4.10	4.5-14.5	7/27/1995	0.00	4.34	4.5-14.5	7/27/1995	0.00	4.85	4.5-14.5
6/29/1995	0.00	4.30	4.5-14.5	9/28/1995	0.00	5.21	4.5-14.5	9/28/1995	0.00	5.38	4.5-14.5
7/27/1995	0.00	3.83	4.5-14.5	11/30/1995	NA	5.32	4.5-14.5	11/30/1995	Sheen	5.54	4.5-14.5
9/28/1995	0.00	4.68	4.5-14.5	12/27/1995	NA	4.83	4.5-14.5	12/27/1995	NA	5.35	4.5-14.5
11/30/1995	NA	4.59	4.5-14.5	1/31/1996	NA	4.81	4.5-14.5	1/31/1996	NA	5.52	4.5-14.5
12/27/1995	NA	4.50	4.5-14.5	2/29/1996	NA	5.11	4.5-14.5	2/29/1996	Sheen	5.61	4.5-14.5
1/31/1996	NA	4.53	4.5-14.5	3/28/1996	NA	4.82	4.5-14.5	3/28/1996	NA	5.19	4.5-14.5
2/29/1996	0.00	4.75	4.5-14.5	4/25/1996		3.95	4.5-14.5	4/25/1996		4.63	4.5-14.5
3/28/1996	NA	4.33	4.5-14.5	5/30/1996	NA	4.47	4.5-14.5	5/30/1996	NA	5.03	4.5-14.5
4/25/1996	NA	3.42	4.5-14.5	7/2/1996	NA	4.48	4.5-14.5	7/2/1996	NA	5.02	4.5-14.5
5/30/1996	NA	4.20	4.5-14.5	7/31/1996	NA	4.84	4.5-14.5	7/31/1996	NA	5.02	4.5-14.5
7/2/1996	NA	4.02	4.5-14.5	9/19/1996	NA	5.08	4.5-14.5	9/19/1996	NA	5.32	4.5-14.5
7/31/1996	0.01	4.21	4.5-14.5	9/30/1996	NA	4.60	4.5-14.5	9/30/1996	NA	4.89	4.5-14.5
9/19/1996	NA	4.69	4.5-14.5	10/17/1996	NA	4.91	4.5-14.5	10/17/1996	0.01	5.88	4.5-14.5
9/30/1996	NA	4.43	4.5-14.5	11/15/1996	NA	5.12	4.5-14.5	11/15/1996	0.00	5.43	4.5-14.5
10/17/1996	0.01	5.14	4.5-14.5	12/26/1996	NA	5.18	4.5-14.5	12/26/1996	Sheen	5.60	4.5-14.5
11/15/1996	0.00	4.49	4.5-14.5	3/31/1997	NA	NA	4.5-14.5	3/31/1997	0.00	5.08	4.5-14.5
12/26/1996	Sheen	4.69	4.5-14.5					1/14/1998	Sheen	5.05	4.5-14.5
3/31/1997	0.00	4.85	4.5-14.5					1/28/1998	Sheen	5.23	4.5-14.5
1/14/1998	Inaccessible		4.5-14.5					2/13/1998	Sheen	5.35	4.5-14.5
1/28/1998	Inaccessible		4.5-14.5					2/27/1998	Sheen	5.07	4.5-14.5
2/13/1998	Inaccessible		4.5-14.5					3/13/1998	Sheen	5.08	4.5-14.5
2/27/1998	Inaccessible		4.5-14.5					3/25/1998	Sheen	5.01	4.5-14.5
3/13/1998	Inaccessible		4.5-14.5					4/9/1998	Sheen	5.55	4.5-14.5
3/25/1998	Inaccessible		4.5-14.5					4/22/1998	Sheen	5.48	4.5-14.5
4/9/1998	Inaccessible		4.5-14.5					5/7/1998	Sheen	5.15	4.5-14.5
4/22/1998	Inaccessible		4.5-14.5					5/21/1998	Sheen	5.67	4.5-14.5
5/7/1998	Inaccessible		4.5-14.5					6/5/1998	Sheen	4.54	4.5-14.5
5/21/1998	Inaccessible		4.5-14.5					6/24/1998	Sheen	4.76	4.5-14.5
6/5/1998	Inaccessible		4.5-14.5					7/13/1998	Sheen	4.89	4.5-14.5
6/24/1998	Inaccessible		4.5-14.5					7/22/1998	Sheen	5.07	4.5-14.5
7/13/1998	Inaccessible		4.5-14.5					8/26/1998	Sheen	5.61	4.5-14.5
7/22/1998	Inaccessible		4.5-14.5					9/14/1998	Sheen	5.16	4.5-14.5
8/26/1998	Inaccessible		4.5-14.5					9/28/1998	Sheen	4.95	4.5-14.5
9/14/1998	Inaccessible		4.5-14.5					10/12/1998	Sheen	5.05	4.5-14.5
9/28/1998	Inaccessible		4.5-14.5					10/22/1998	Sheen	5.02	4.5-14.5
10/12/1998	Inaccessible		4.5-14.5					11/5/1998	Sheen	4.75	4.5-14.5
10/22/1998	Inaccessible		4.5-14.5					11/18/1998	NA	5.03	4.5-14.5
11/5/1998	Inaccessible		4.5-14.5								
11/18/1998	Inaccessible		4.5-14.5					3/20/2003	Sheen	3.96	4.5-14.5

Note:
ft: Feet
NA: Not Available
Highlighted depths to GW above top of screened interval

Table 3A-10(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Sub-area 2A: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Benzene	12	3	0.51	225	443	NA	N/A
Dichlorodifluoromethane	2	11	1.26	4.3	3.4	NA	N/A
Ethylbenzene	12	3	0.07	28	376	NA	N/A
Methylene chloride	7	1	1.83	5.3	2.9	NA	N/A
Tetrachloroethene	7	3	2.45	26	11	NA	N/A
Toluene	12	3	3.00	57	19	NA	N/A
Xylenes, Total	3	1	2.30	90	39	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	8	5	5.42	640,000	118,086	NA	N/A
TPH GRO	7	4	2.17	27,000	12,428	NA	N/A
TPH ORO	3	0	N/A	ND	2,500	NA	N/A
Total Metals							
Aluminum	5	4	1.17	18,900,000	16,175,000	41,000,000	N
Antimony	5	4	1.31	4,950	3,785	520	Y
Arsenic	5	4	1.55	60,400	38,875	9,200	Y
Barium	5	4	1.34	254,000	189,250	725,000	N
Beryllium	5	4	1.15	1,270	1,106	800	Y
Cadmium	5	1	3.00	2,190	730	<1,000	Y
Calcium	5	4	1.93	16,000,000	8,307,500	3,300,000	Y
Chromium	5	4	1.16	20,200	17,400	58,000	N
Cobalt	5	4	1.83	11,200	6,125	10,000	Y
Copper	5	4	2.77	93,000	33,525	13,000	Y
Iron	5	4	1.13	21,900,000	19,425,000	21,000,000	Y
Lead	6	5	3.03	140,000	46,166	21,800	Y
Magnesium	5	4	2.09	7,510,000	3,600,000	2,600,000	Y
Manganese	5	4	1.69	613,000	362,250	740,000	N
Mercury	5	4	2.31	112	49	39	Y
Nickel	5	4	1.26	19,900	15,750	14,000	Y
Potassium	5	4	1.55	2,210,000	1,427,500	14,000,000	N
Sodium	5	4	1.53	2,930,000	1,920,000	5,300,000	N
Vanadium	5	4	1.14	39,300	34,375	69,000	N
Zinc	5	4	2.53	219,000	86,675	49,000	Y

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 3A-10(b)
Soil Constituents of Concern Summary for Construction Worker for Sub-area 2A: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			Max Detected Exceeds Background
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	
Volatile Organic Compounds (VOCs)							
Benzene	14	3	0.36	225	622	NA	N/A
Dichlorodifluoromethane	3	1	1.39	4.3	3.1	NA	N/A
Ethylbenzene	14	3	0.05	28	570	NA	N/A
Methylene chloride	9	2	1.50	5.3	3.5	NA	N/A
Tetrachloroethene	9	4	2.48	26	10	NA	N/A
Toluene	14	5	6.99	472	67	NA	N/A
Trichloroethene	9	1	1.39	2.6	1.9	NA	N/A
Xylenes, Total	4	1	3.00	90	30	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	10	6	6.68	14,890,000	2,228,359	NA	N/A
TPH GRO	8	4	2.17	27,000	12,428	NA	N/A
TPH ORO	4	0	N/A	ND	2,500	NA	N/A
Total Metals							
Aluminum	6	4	1.17	18,900,000	16,175,000	41,000,000	N
Antimony	6	4	1.31	4,950	3,785	520	Y
Arsenic	6	4	1.55	60,400	38,875	9,200	Y
Barium	6	4	1.34	254,000	189,250	725,000	N
Beryllium	6	4	1.15	1,270	1,106	800	Y
Cadmium	6	1	3.00	2,190	730	<1,000	Y
Calcium	6	4	1.93	16,000,000	8,307,500	3,300,000	Y
Chromium	6	4	1.16	20,200	17,400	58,000	N
Cobalt	6	4	1.83	11,200	6,125	10,000	Y
Copper	6	4	2.77	93,000	33,525	13,000	Y
Iron	6	4	1.13	21,900,000	19,425,000	21,000,000	Y
Lead	8	6	3.52	140,000	39,773	21,800	Y
Magnesium	6	4	2.09	7,510,000	3,600,000	2,600,000	Y
Manganese	6	4	1.69	613,000	362,250	740,000	N
Mercury	6	4	2.31	112	49	39	Y
Nickel	6	4	1.26	19,900	15,750	14,000	Y
Potassium	6	4	1.55	2,210,000	1,427,500	14,000,000	N
Sodium	6	4	1.53	2,930,000	1,920,000	5,300,000	N
Vanadium	6	4	1.14	39,300	34,375	69,000	N
Zinc	6	4	2.53	219,000	86,675	49,000	Y

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 3B-10(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Sub-area 2B: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			Max Detected Exceeds Background
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	
Volatile Organic Compounds (VOCs)							
Acetone	30	10	12.72	27,000	2,122	NA	N/A
Chloroethane	14	1	1.56	48	31	NA	N/A
cis-1,2-Dichloroethene	38	2	2.92	500	171	NA	N/A
Ethylbenzene	34	2	6.18	330	53	NA	N/A
Isopropylbenzene	10	2	2.12	210	99	NA	N/A
Methyl ethyl ketone (MEK)	26	3	4.40	6,100	1,386	NA	N/A
Methylene chloride	34	5	0.47	40	85	NA	N/A
Naphthalene	10	1	4.82	2,100	436	NA	N/A
n-Butylbenzene	10	3	3.05	1,200	394	NA	N/A
n-Propylbenzene	10	2	2.49	420	169	NA	N/A
p-Isopropyltoluene	8	1	1.39	130	93	NA	N/A
sec-Butylbenzene	10	2	3.02	540	179	NA	N/A
Tetrachloroethene	38	12	14.42	1,700,000	117,893	NA	N/A
Toluene	34	2	0.30	26	85	NA	N/A
trans-1,2-Dichloroethene	38	2	2.26	44	20	NA	N/A
Trichloroethene	34	3	9.02	2,200	244	NA	N/A
Vinyl chloride	20	1	0.33	9.6	29	NA	N/A
Xylenes, Total	16	3	7.29	1,000	137	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	14	7	2.32	1,900,000	817,829	NA	N/A
TPH GRO	13	1	3.09	180,000	58,214	NA	N/A
TPH ORO	14	1	3.98	160,000	40,250	NA	N/A
Total Metals							
Aluminum	14	4	1.78	22,700,000	12,735,000	41,000,000	N
Antimony	14	4	1.79	4,500	2,513	520	Y
Arsenic	18	17	4.01	46,300	11,546	9,200	Y
Barium	18	18	3.53	310,000	87,719	725,000	N
Beryllium	14	4	1.72	1,460	849	800	Y
Cadmium	18	13	12.33	20,200	1,638	<1,000	Y
Calcium	14	4	1.33	16,400,000	12,337,500	3,300,000	Y
Chromium	18	18	2.89	74,700	25,878	58,000	Y
Cobalt	14	4	1.98	13,100	6,613	10,000	Y
Copper	14	4	1.62	19,000	11,748	13,000	Y
Iron	14	4	1.89	34,200,000	18,090,000	21,000,000	Y
Lead	18	12	16.61	2,260,000	136,043	21,800	Y
Magnesium	14	4	2.53	39,600,000	15,625,000	2,600,000	Y
Manganese	14	4	2.45	2,070,000	844,250	740,000	Y
Mercury	18	8	4.82	550	114	39	Y
Nickel	14	4	1.76	31,100	17,715	14,000	Y
Potassium	14	4	1.35	1,120,000	827,250	14,000,000	N
Selenium	18	4	4.01	4,020	1,003	260	Y
Silver	18	10	2.64	3,410	1,289	<700	Y
Sodium	14	4	1.56	348,000	223,750	5,300,000	N
Thallium	14	1	1.68	3,430	2,039	<100	Y
Vanadium	14	4	1.66	46,700	28,130	69,000	N
Zinc	14	4	1.42	51,800	36,425	49,000	Y

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Tab. [illegible])
Soil Constituents of Concern Summary for Cons[illegible] Worker for Sub-area 2B: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
1,1-Dichloroethene	58	1	9.38	200	21	NA	N/A
1,2,4-Trimethylbenzene	26	1	1.50	35	23	NA	N/A
Acetone	60	23	26.10	27,000	1,034	NA	N/A
Chloroethane	38	2	4.56	94	21	NA	N/A
cis-1,2-Dichloroethene	69	14	18.35	68,000	3,706	NA	N/A
Ethylbenzene	59	5	19.79	2,700	136	NA	N/A
Isopropylbenzene	26	3	4.96	210	42	NA	N/A
m,p-Xylene	18	2	8.80	1,600	182	NA	N/A
Methyl ethyl ketone (MEK)	49	10	6.13	6,100	994	NA	N/A
Methylene chloride	58	15	1.17	69	59	NA	N/A
Naphthalene	26	1	13.61	2,100	154	NA	N/A
n-Butylbenzene	26	5	5.99	1,200	200	NA	N/A
n-Propylbenzene	26	3	6.38	420	66	NA	N/A
o-Xylene	18	2	8.30	540	65	NA	N/A
p-Isopropyltoluene	19	1	2.72	130	48	NA	N/A
sec-Butylbenzene	26	7	4.76	540	113	NA	N/A
Tetrachloroethene	69	25	32.72	9,300,000	284,245	NA	N/A
Toluene	59	5	9.05	1,600	177	NA	N/A
trans-1,2-Dichloroethene	69	7	15.32	7,200	470	NA	N/A
Trichloroethene	58	7	20.34	14,000	688	NA	N/A
Vinyl chloride	44	3	14.19	560	39	NA	N/A
Xylenes, Total	47	10	10.05	5,100	507	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	45	20	3.64	1,900,000	521,665	NA	N/A
TPH GRO	28	2	4.85	180,000	37,150	NA	N/A
TPH ORO	29	1	0.52	16,000	30,667	NA	N/A
Total Metals							
Aluminum	14	4	1.78	22,700,000	12,735,000	41,000,000	N
Antimony	14	4	1.79	4,500	2,513	520	Y
Arsenic	25	21	4.22	46,300	10,969	9,200	Y
Barium	25	25	3.39	310,000	91,438	725,000	N
Beryllium	14	4	1.72	1,460	849	800	Y
Cadmium	25	14	15.67	20,200	1,289	<1,000	Y
Calcium	14	4	1.33	16,400,000	12,337,500	3,300,000	Y
Chromium	25	25	3.27	74,700	22,860	58,000	Y
Cobalt	14	4	1.98	13,100	6,613	10,000	Y
Copper	14	4	1.62	19,000	11,748	13,000	Y
Iron	14	4	1.89	34,200,000	18,090,000	21,000,000	Y
Lead	25	19	22.43	2,260,000	100,759	21,800	Y
Magnesium	14	4	2.53	39,600,000	15,625,000	2,600,000	Y
Manganese	14	4	2.45	2,070,000	844,250	740,000	Y
Mercury	25	15	2.88	560	194	39	Y
Nickel	14	4	1.76	31,100	17,715	14,000	Y
Potassium	14	4	1.35	1,120,000	827,250	14,000,000	N
Selenium	25	7	4.42	4,020	909	260	Y
Silver	25	10	3.04	3,410	1,122	<700	Y
Sodium	14	4	1.56	348,000	223,750	5,300,000	N
Thallium	14	1	1.68	3,430	2,039	<100	Y
Vanadium	14	4	1.66	46,700	28,130	69,000	N
Zinc	14	4	1.42	51,800	36,425	49,000	Y

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 3C-10(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Sub-area 2C: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
None	2	0	N/A	N/A	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	2	1	1.00	1,330,000	1,330,000	NA	N/A
TPH GRO	3	1	1.00	13,000	13,000	NA	N/A
TPH ORO	2	1	1.00	34,000	34,000	NA	N/A
Total Metals							
Lead	1	1	1.00	8210	8,210	21,800	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 3C-10(b)
Soil Constituents of Concern Summary for Construction Worker for Sub-area 2C: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Benzene	11	4	3.00	307	102.42	NA	N/A
Ethylbenzene	11	3	2.37	408	172.25	NA	N/A
Methylene chloride	1	1	1.00	5.8	5.80	NA	N/A
Toluene	11	5	3.93	3,000	762.42	NA	N/A
Xylenes, Total	11	5	2.00	829	415	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	11	3	7.50	1,330,000	177,313	NA	N/A
TPH GRO	9	6	1.37	133,000	97,167	NA	N/A
TPH ORO	9	1	2.24	34,000	15,167	NA	N/A
Total Metals							
Lead	1	1	1.00	8210	8,210	21,800	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 3A-11
Groundwater Constituents of Concern Summary for Sub-area 2A: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
Benzene	8	1	3.71	817	220	5	Y
Ethylbenzene	8	1	3.82	130	34	700	N
Methyl ter-butyl ether	7	1	2.86	20	7.0	146	N
Methylene chloride	4	1	0.38	2.1	5.5	49.1	N
Tetrachloroethene	4	2	1.16	4.8	4.2	5	N
Toluene	8	2	2.50	61	24	1,000	N
Xylenes, Total	4	2	2.21	179	81	10,000	N
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	5	2	2.00	190,000	95,155	NA	N/A
TPH GRO	5	1	1.98	1,100,000	555,250	NA	N/A
TPH ORO	5	0	N/A	ND	288	NA	N/A
Total Metals							
Arsenic	2	2	1.25	58	47	10	Y
Barium	2	2	1.31	1,000	765	2,000	N
Cadmium	2	2	1.57	14	8.9	5	Y
Chromium	2	2	1.42	56	40	100	N
Lead	3	2	2.74	100	37	15	Y

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 11

Groundwater Constituents of Concern Summary for Sub-area 2B: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
1,1,1-Trichloroethane	125	1	0.06	9.3	147	200	N
1,1-Dichloroethane	125	3	0.07	11	147	157	N
1,1-Dichloroethene	125	3	1.20	180	150	7.0	Y
1,2,3-Trimethylbenzene	11	1	0.58	28	48	2.6	Y
1,2,4-Trimethylbenzene	113	4	1.81	330	182	2.6	Y
Acetone	118	5	0.01	55	5,224	121	N
Benzene	134	15	2.84	680	239	5	Y
cis-1,2-Dichloroethene	129	60	21.57	97,000	4,497	70	Y
Ethylbenzene	130	7	1.35	200	148	700	N
Isopropylbenzene	116	20	0.65	120	185	4,000	N
Methyl isobutyl ketone	118	1	0.00	25	5,223	32.7	N
Methyl ter-butyl ether	123	7	6.29	1,400	222	146	Y
Methylene chloride	125	2	0.02	8.5	512	49.1	N
Naphthalene	114	4	1.68	540	321	100	Y
n-Butylbenzene	116	21	16.26	3,600	221	48.6	Y
n-Propylbenzene	116	21	1.06	200	189	5.3	Y
p-Isopropyltoluene	112	17	0.05	6.4	139	107	N
sec-Butylbenzene	117	30	10.13	2,100	207	48.6	Y
tert-Butylbenzene	113	2	0.02	3.2	181	48.6	N
Tetrachloroethene	134	59	25.63	490,000	19,115	5	Y
Toluene	130	7	1.85	1,200	649	1,000	Y
trans-1,2-Dichloroethene	125	13	1.00	150	150	100	Y
Trichloroethene	129	51	42.19	84,000	1,991	5	Y
Trichlorofluoromethane	113	1	0.01	2.5	244	2,000	N
Vinyl chloride	126	25	6.05	4,400	728	2	Y
Xylenes, Total	128	10	3.39	1,200	354	10,000	N
Polynuclear Aromatic Hydrocabons							
None	1	0	N/A	ND	N/A	N/A	N/A
Polychlorinated Biphenyls							
None	1	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	153	60	10.00	2,200,000	219,968	NA	N/A
TPH GRO	56	12	10.87	110,000	10,123	NA	N/A
TPH ORO	56	25	13.42	212,199	15,814	NA	N/A
Total Metals							
Arsenic	2	2	1.94	130	67	10	Y
Barium	2	2	1.57	1,600	1,020	2,000	N
Cadmium	2	1	1.37	5.4	4.0	5	Y
Chromium	2	1	1.58	19	12	100	N
Lead	2	2	1.23	6.7	5.5	15	N
Selenium	2	1	1.68	13	7.8	50	N

Notes:

ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 3C-11
Groundwater Constituents of Concern Summary for Sub-area 2C: Demolished Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
Benzene	13	8	4.54	921	203	5	Y
Ethylbenzene	13	3	6.56	180	27	700	N
Methyl ter-butyl ether	11	2	5.07	59	12	146	N
Toluene	13	3	3.55	60	17	1,000	N
Xylenes, Total	12	3	2.84	24	8.3	10,000	N
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	11	3	1.95	1,000	513	NA	N/A
TPH GRO	10	5	4.09	301,200	73,658	NA	N/A
TPH ORO	9	0	N/A	ND	429	NA	N/A
Total Metals							
Lead	1	1	1.00	22	22	15	Y

Notes:

ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 3A-12(a)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker
Sub-area 2A: Demolished Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc.	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	(ug/L)	IELCR	HQ		
Benzene	443	2.71E-08	1.54E-03	220	3.26E-08	1.85E-03	5.96E-08	3.39E-03
Dichlorodifluoromethane	3.4	NA	5.11E-06	—	—	—	NA	5.11E-06
Ethylbenzene	376	NA	1.60E-06	—	—	—	NA	1.60E-06
Methylene chloride	2.9	1.80E-11	3.57E-08	—	—	—	1.80E-11	3.57E-08
Tetrachloroethene	10.6	4.85E-11	5.86E-07	—	—	—	4.85E-11	5.86E-07
Toluene	19	NA	3.95E-07	—	—	—	NA	3.95E-07
Xylenes, total	39	NA	1.87E-07	—	—	—	NA	1.87E-07
Organics Total Risk		**2.71E-08**	**1.55E-03**		**3.26E-08**	**1.85E-03**	**5.97E-08**	**3.40E-03**
TPH-GRO	12,428	NA	1.27E-04	555,250	NA	3.39E+00	NA	3.39E+00
TPH-DRO	118,086	NA	1.19E-04	95,155	NA	1.89E+01	NA	1.89E+01
TPH-ORO	2,500	NA	6.40E-08	288	NA	1.51E-01	NA	1.51E-01
TPH Total Risk		**NA**	**2.47E-04**		**NA**	**2.24E+01**	**NA**	**2.24E+01**
Arsenic	38,875	NA	NA	47	NA	NA	NA	NA
Cadmium	730	NA	NA	8.9	NA	NA	NA	NA
Mercury	49	NA	1.37E-04	—	—	—	NA	1.37E-04
Antimony	3,785	NA	NA	—	—	—	NA	NA
Beryllium	1,106	NA	NA	—	—	—	NA	NA
Cobalt	6,125	NA	NA	—	—	—	NA	NA
Copper	33,525	NA	NA	—	—	—	NA	NA
Nickel	15,750	NA	NA	—	—	—	NA	NA
Zinc	86,675	NA	NA	—	—	—	NA	NA
Metals Total Risk		**NA**	**1.37E-04**		**NA**	**NA**	**NA**	**1.37E-04**
CUMULATIVE RISK		**2.71E-08**	**1.93E-03**		**3.26E-08**	**2.24E+01**	**5.97E-08**	**2.24E+01**

Notes:
NA: Not available
—: Risk evaluation was not performed.
HI: Hazard index
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter
GRO: Gasoline range organic
DRO: Diesel range organic
ORO: Oil range organic
TPH: Total petroleum hydrocarbon

Table 3A-12(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 2A: Demolished Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc.	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ	(ug/L)	IELCR	HQ	IELCR	HQ		
Benzene	622	8.99E-11	7.23E-05	9.99E-11	8.04E-05	5.10E-10	7.24E-04	220	4.24E-08	3.42E-02	1.74E-11	2.46E-05	4.32E-08	3.51E-02
Dichlorodifluoromethane	3.1	NA	1.80E-08	NA	6.01E-09	NA	4.10E-07	—	—	—	—	—	NA	4.34E-07
Ethylbenzene	570	NA	1.99E-06	NA	2.03E-06	NA	1.78E-06	—	—	—	—	—	NA	5.80E-06
Methylene chloride	3.5	1.32E-13	2.05E-08	1.47E-13	2.28E-08	2.20E-13	1.09E-08	—	—	—	—	—	4.99E-13	5.43E-08
Tetrachloroethene	10	2.71E-13	3.65E-08	3.02E-12	4.06E-07	6.22E-13	1.88E-07	—	—	—	—	—	3.91E-12	6.30E-07
Toluene	67	NA	1.18E-08	NA	1.31E-07	NA	7.41E-07	—	—	—	—	—	NA	8.84E-07
Trichloroethene	1.9	1.70E-16	1.81E-10	1.14E-13	1.21E-07	2.47E-13	2.90E-07	—	—	—	—	—	3.61E-13	4.11E-07
Xylenes, total	30.0	NA	5.23E-09	NA	5.35E-09	NA	1.19E-07	—	—	—	—	—	NA	1.30E-07
Organics Total Risk		**9.03E-11**	**7.44E-05**	**1.03E-10**	**8.31E-05**	**5.11E-10**	**7.28E-04**		**4.24E-08**	**3.42E-02**	**1.74E-11**	**2.46E-05**	**4.32E-08**	**3.51E-02**
TPH-GRO	12,428	NA	NA	NA	5.65E-05	NA	7.32E-05	555,250	NA	NA	NA	3.04E-02	NA	3.06E-02
TPH-DRO	2,228,359	NA	4.91E-03	NA	1.49E-02	NA	4.28E-03	95,155	NA	NA	NA	1.68E-01	NA	1.92E-01
TPH-ORO	2,500	NA	6.37E-06	NA	1.64E-05	NA	5.16E-07	288	NA	NA	NA	1.35E-03	NA	1.37E-03
TPH Total Risk		**NA**	**4.92E-03**	**NA**	**1.50E-02**	**NA**	**4.35E-03**		**NA**	**NA**	**NA**	**2.00E-01**	**NA**	**2.24E-01**
Arsenic	38,875	9.68E-10	1.51E-04	3.07E-07	4.77E-02	5.10E-10	7.94E-06	47	NA	NA	NA	NA	3.08E-07	4.79E-02
Cadmium	730	NA	1.70E-05	NA	5.66E-04	4.02E-12	8.94E-08	8.9	NA	NA	NA	NA	4.02E-12	5.83E-04
Mercury	49	NA	1.88E-07	NA	9.40E-06	NA	2.27E-04	—	—	—	—	—	NA	2.36E-04
Antimony	3,785	NA	1.10E-04	NA	3.67E-03	NA	4.07E-06	—	—	—	—	—	NA	3.78E-03
Beryllium	1,106	7.90E-10	6.43E-06	2.63E-10	2.14E-06	8.13E-12	1.19E-08	—	—	—	—	—	1.06E-09	8.58E-06
Cobalt	6,125	NA	3.56E-04	NA	1.19E-04	5.25E-11	6.58E-05	—	—	—	—	—	5.25E-11	5.40E-04
Copper	33,525	NA	9.74E-06	NA	3.25E-04	NA	7.18E-06	—	—	—	—	—	NA	3.42E-04
Nickel	15,750	NA	4.58E-07	NA	3.05E-05	1.16E-11	1.69E-05	—	—	—	—	—	1.16E-11	4.79E-05
Zinc	86,675	NA	3.36E-06	NA	2.80E-05	NA	1.77E-08	—	—	—	—	—	NA	3.14E-05
Metals Total Risk		**1.76E-09**	**6.54E-04**	**3.07E-07**	**5.24E-02**	**5.86E-10**	**3.29E-04**		**NA**	**NA**	**NA**	**NA**	**3.09E-07**	**5.34E-02**
CUMULATIVE RISK		**1.85E-09**	**5.65E-03**	**3.07E-07**	**6.75E-02**	**1.10E-09**	**5.41E-03**		**4.24E-08**	**3.42E-02**	**1.74E-11**	**2.00E-01**	**3.52E-07**	**3.13E-01**

Notes:
NA: Not available
—: Risk evaluation was not performed.
HI: Hazard index
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter
GRO: Gasoline range organic
DRO: Diesel range organic
ORO: Oil range organic
TPH: Total petroleum hydrocarbon

Table 3B-12(a)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker
Sub-area 2B: Demolished Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc.	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	(ug/L)	IELCR	HQ		
1,1-Dichloroethene	---	---	---	150	5.95E-07	5.95E-02	5.95E-07	5.95E-02
1,2,3-Trimethylbenzene	---	---	---	48	NA	1.91E-04	NA	1.91E-04
1,2,4-Trimethylbenzene	---	---	---	182	NA	1.41E-03	NA	1.41E-03
Acetone	2,122	NA	2.40E-05	---	---	---	NA	2.40E-05
Benzene	---	---	---	239	3.54E-08	3.54E-03	3.54E-08	3.54E-03
Chloroethane	31	1.32E-09	4.38E-07	---	---	---	1.32E-09	4.38E-07
cis-1,2-Dichloroethene	171	NA	9.96E-05	4,497	NA	4.26E-03	NA	4.36E-03
Ethylbenzene	53	NA	2.27E-07	---	---	---	NA	2.27E-07
Isopropyl benzene	99	NA	9.64E-06	---	---	---	NA	9.64E-06
Methyl ethyl ketone (MEK)	1,386	NA	3.02E-06	---	---	---	NA	3.02E-06
Methylene chloride	85	5.27E-10	1.04E-06	---	---	---	5.27E-10	1.04E-06
Methyl tert-butyl ether (MTBE)	---	---	---	222	4.76E-11	4.76E-06	4.76E-11	4.76E-06
Naphthalene	436	NA	5.83E-06	321	NA	3.95E-04	NA	4.01E-04
n-Butylbenzene	394	NA	2.66E-06	221	NA	1.48E-04	NA	1.51E-04
n-Propylbenzene	169	NA	3.42E-06	189	NA	1.03E-04	NA	1.06E-04
p-Isopropyltoluene	93	NA	2.37E-07	---	---	---	NA	2.37E-07
sec-Butylbenzene	179	NA	2.19E-06	207	NA	1.94E-04	NA	1.96E-04
Tetrachloroethene	117,893	5.39E-07	6.50E-03	19,115	4.91E-07	4.91E-02	1.03E-06	5.56E-02
Toluene	85	NA	1.78E-06	649	NA	9.32E-05	NA	9.49E-05
trans-1,2-Dichloroethene	20	NA	8.54E-06	150	NA	1.43E-04	NA	1.51E-04
Trichloroethene	244	1.89E-09	8.89E-05	1,991	9.58E-08	9.58E-03	9.77E-08	9.67E-03
Vinyl chloride	29	2.61E-07	8.55E-05	728	5.55E-06	5.55E-01	5.81E-06	5.55E-01
Xylenes, Total	137	NA	6.55E-07	---	---	---	NA	6.55E-07
Organics Total Risk		**8.04E-07**	**6.84E-03**		**6.77E-06**	**6.84E-01**	**7.57E-06**	**6.91E-01**
Aliphatics > nC6 to nC8 (TX1006)	---	---	---	4,660	NA	2.72E-03	NA	2.72E-03
Aliphatics > nC8 to nC10 (TX1006)	---	---	---	2,732	NA	4.70E-02	NA	4.70E-02
Aromatics > nC8 to nC10 (TX1006)	---	---	---	2,732	NA	1.53E-03	NA	1.53E-03
TPH-GRO	**58,214**	**NA**	**5.96E-04**	**10,123**	**NA**	**5.12E-02**	**NA**	**5.18E-02**
Aliphatics > nC10 to nC12 (TX1006)	---	---	---	17,717	NA	4.57E-01	NA	4.57E-01
Aliphatics > nC12 to nC16 (TX1006)	---	---	---	63,149	NA	7.05E+00	NA	7.05E+00
Aliphatics > nC16 to nC21 (TX1006)	---	---	---	74,726	NA	7.86E+01	NA	7.86E+01
Aromatics > nC10 to nC12 (TX1006)	---	---	---	8,107	NA	1.47E-03	NA	1.47E-03
Aromatics > nC12 to nC16 (TX1006)	---	---	---	30,484	NA	2.30E-03	NA	2.30E-03
Aromatics > nC16 to nC21 (TX1006)	---	---	---	25,786	NA	5.42E-04	NA	5.42E-04
TPH-DRO	**817,829**	**NA**	**8.26E-04**	**219,968**	**NA**	**8.62E+01**	**NA**	**8.62E+01**
Aliphatics > nC21 to nC35 (TX1006)	---	---	---	8,786	NA	9.25E+00	NA	9.25E+00
Aromatics > nC21 to nC35 (TX1006)	---	---	---	7,028	NA	1.71E-05	NA	1.71E-05
TPH-ORO	**40,250**	**NA**	**1.03E-06**	**15,814**	**NA**	**9.25E+00**	**NA**	**9.25E+00**
TPH Total Risk		**NA**	**1.42E-03**		**NA**	**9.54E+01**	**NA**	**9.54E+01**
Arsenic	11,546	NA	NA	67	NA	NA	NA	NA
Cadmium	1,638	NA	NA	4.0	NA	NA	NA	NA
Chromium	25,878	NA	NA	---	---	---	NA	NA
Mercury	114	NA	3.22E-04	---	---	---	NA	3.22E-04
Selenium	1,003	NA	NA	---	---	---	NA	NA
Silver	1,289	NA	NA	---	---	---	NA	NA
Antimony	2,513	NA	NA	---	---	---	NA	NA
Beryllium	849	NA	NA	---	---	---	NA	NA
Cobalt	6,613	NA	NA	---	---	---	NA	NA
Copper	11,748	NA	NA	---	---	---	NA	NA
Manganese	844,250	NA	NA	---	---	---	NA	NA
Nickel	17,715	NA	NA	---	---	---	NA	NA
Thallium	2,039	NA	NA	---	---	---	NA	NA
Zinc	36,425	NA	NA	---	---	---	NA	NA
Metals Total Risk		**NA**	**3.22E-04**		**NA**	**NA**	**NA**	**3.22E-04**
CUMULATIVE RISK		**8.04E-07**	**8.59E-03**		**6.77E-06**	**9.61E+01**	**7.57E-06**	**9.61E+01**

Notes:
NA: Not available
---: Risk evaluation was not performed.
HI: Hazard index
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter
GRO: Gasoline range organic
DRO: Diesel range organic
ORO: Oil range organic
TPH: Total petroleum hydrocarbon

Table 3B-12(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 2B: Demolished Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc.	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ	(ug/L)	IELCR	HQ	IELCR	HQ		
1,1-Dichloroethene	21	6.37E-11	8.26E-07	7.08E-11	9.18E-07	2.30E-10	1.62E-06	150	2.28E-07	2.95E-03	2.34E-10	1.64E-06	2.28E-07	2.96E-03
1,2,3-Trimethylbenzene	—	—	—	—	—	—	—	48	NA	NA	NA	3.11E-06	NA	3.11E-06
1,2,4-Trimethylbenzene	23	NA	1.63E-07	NA	1.66E-07	NA	3.45E-06	182	NA	NA	NA	1.73E-05	NA	2.11E-05
Acetone	1,034	NA	3.61E-06	NA	3.81E-06	NA	8.96E-06	—	—	—	—	—	NA	1.64E-05
Benzene	—	—	—	—	—	—	—	239	4.61E-08	3.71E-02	1.89E-11	2.68E-05	4.61E-08	3.71E-02
Chloroethane	21	9.93E-13	5.99E-08	3.31E-13	2.00E-08	4.48E-12	3.73E-08	—	—	—	—	—	5.80E-12	1.17E-07
cis-1,2-Dichloroethene	3,706	NA	1.29E-05	NA	1.44E-04	NA	7.28E-04	4,497	NA	NA	NA	7.15E-05	NA	9.56E-04
Ethylbenzene	136	NA	4.76E-07	NA	4.86E-07	NA	4.25E-07	—	—	—	—	—	NA	1.39E-06
Isopropyl benzene	42	NA	1.48E-07	NA	1.64E-07	NA	1.03E-06	—	—	—	—	—	NA	1.34E-06
m,p-Xylene	182	NA	1.06E-07	NA	3.52E-08	NA	1.72E-06	—	—	—	—	—	NA	1.86E-06
Methyl ethyl ketone (MEK)	994	NA	5.78E-07	NA	6.42E-07	NA	2.24E-06	—	—	—	—	—	NA	3.46E-06
Methylene chloride	59	2.20E-12	3.42E-07	2.44E-12	3.80E-07	3.67E-12	1.81E-07	—	—	—	—	—	8.31E-12	9.03E-07
Methyl tert-butyl ether	—	—	—	—	—	—	—	222	1.04E-09	2.58E-05	1.03E-13	2.39E-08	1.04E-09	2.58E-05
Naphthalene	154	NA	2.69E-06	NA	2.99E-06	NA	1.57E-05	321	NA	NA	NA	2.52E-05	NA	4.66E-05
n-Butylbenzene	200	NA	5.82E-06	NA	1.94E-06	NA	2.12E-06	221	NA	NA	NA	1.58E-06	NA	1.15E-05
n-Propylbenzene	66	NA	2.30E-05	NA	2.55E-05	NA	1.21E-06	189	NA	NA	NA	1.14E-06	NA	5.08E-05
o-Xylene	65	NA	3.78E-08	NA	1.26E-08	NA	6.37E-08	—	—	—	—	—	NA	1.14E-07
p-Isopropyltoluene	48	NA	5.56E-07	NA	1.85E-07	NA	2.12E-07	—	—	—	—	—	NA	9.53E-07
sec-Butylbenzene	113	NA	3.30E-06	NA	1.10E-06	NA	1.62E-06	207	NA	NA	NA	1.97E-06	NA	7.98E-06
Tetrachloroethene	284,245	7.36E-09	9.91E-04	8.18E-08	1.10E-02	1.69E-08	5.09E-03	19,115	1.51E-05	2.03E+00	2.02E-10	6.09E-05	1.52E-05	2.05E+00
Toluene	177	NA	3.08E-08	NA	3.43E-07	NA	1.94E-06	649	NA	3.24E-03	NA	1.14E-06	NA	3.24E-03
trans-1,2-Dichloroethene	470	NA	8.19E-07	NA	9.10E-06	NA	5.67E-05	150	NA	NA	NA	1.85E-06	NA	6.84E-05
Trichloroethene	688	6.29E-14	6.67E-08	4.19E-11	4.45E-05	9.12E-11	1.07E-04	1,991	1.11E-07	1.18E-01	4.36E-11	5.12E-05	1.11E-07	1.18E-01
Vinyl chloride	39	3.73E-13	4.59E-09	4.15E-10	5.10E-06	1.26E-09	1.03E-05	728	3.19E-06	3.92E-02	2.00E-09	1.63E-05	3.20E-06	3.92E-02
Xylenes, Total	507	NA	2.95E-09	NA	2.46E-08	NA	2.02E-06	—	—	—	—	—	NA	2.05E-06
Organics Total Risk		**7.43E-09**	**1.05E-03**	**8.23E-08**	**1.13E-02**	**1.84E-08**	**6.03E-03**		**1.87E-05**	**2.23E+00**	**2.49E-09**	**2.82E-04**	**1.88E-05**	**2.25E+00**
Aliphatics > nC6 to nC8 (TX1006)	—	—	—	—	—	—	—	4,660	NA	NA	NA	2.43E-05	NA	2.43E-05
Aliphatics > nC8 to nC10 (TX1006)	—	—	—	—	—	—	—	2,732	NA	NA	NA	4.18E-04	NA	4.18E-04
Aromatics > nC8 to nC10 (TX1006)	—	—	—	—	—	—	—	2,732	NA	NA	NA	1.65E-05	NA	1.65E-05
TPH-GRO	**37,150**	**NA**	**NA**	**NA**	**1.69E-04**	**NA**	**2.19E-04**	**10,123**	**NA**	**NA**	**NA**	**4.59E-04**	**NA**	**8.47E-04**
Aliphatics > nC10 to nC12 (TX1006)	—	—	—	—	—	—	—	17,717	NA	NA	NA	4.07E-03	NA	4.07E-03
Aliphatics > nC12 to nC16 (TX1006)	—	—	—	—	—	—	—	63,149	NA	NA	NA	6.28E-02	NA	6.28E-02
Aliphatics > nC16 to nC21 (TX1006)	—	—	—	—	—	—	—	74,726	NA	NA	NA	7.00E-01	NA	7.00E-01
Aromatics > nC10 to nC12 (TX1006)	—	—	—	—	—	—	—	8,107	NA	NA	NA	2.26E-05	NA	2.26E-05
Aromatics > nC12 to nC16 (TX1006)	—	—	—	—	—	—	—	30,484	NA	NA	NA	5.93E-05	NA	5.93E-05
Aromatics > nC16 to nC21 (TX1006)	—	—	—	—	—	—	—	25,786	NA	NA	NA	4.01E-05	NA	4.01E-05
TPH-DRO	**521,665**	**NA**	**1.15E-03**	**NA**	**3.50E-03**	**NA**	**1.00E-03**	**219,968**	**NA**	**NA**	**NA**	**7.66E-01**	**NA**	**7.72E-01**
Aliphatics > nC21 to nC35 (TX1006)	—	—	—	—	—	—	—	8,786	NA	NA	NA	8.22E-02	NA	8.22E-02
Aromatics > nC21 to nC35 (TX1006)	—	—	—	—	—	—	—	7,028	NA	NA	NA	9.46E-06	NA	9.46E-06
TPH-ORO	**30,667**	**NA**	**7.81E-05**	**NA**	**2.01E-04**	**NA**	**6.33E-06**	**15,814**	**NA**	**NA**	**NA**	**8.23E-02**	**NA**	**8.25E-02**
TPH Total Risk		**NA**	**1.23E-03**	**NA**	**3.87E-03**	**NA**	**1.23E-03**		**NA**	**NA**	**NA**	**8.49E-01**	**NA**	**8.56E-01**

Table 3B-12(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 2B: Demolished Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc.	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ	(ug/L)	IELCR	HQ	IELCR	HQ		
Arsenic	10,969	2.73E-10	4.25E-05	8.65E-08	1.35E-02	1.44E-10	2.24E-06	67	NA	NA	NA	NA	8.69E-08	1.35E-02
Cadmium	1,289	NA	3.00E-05	NA	9.99E-04	7.11E-12	1.58E-07	4.0	NA	NA	NA	NA	7.11E-12	1.03E-03
Chromium	22,860	NA	NA	NA	NA	8.40E-10	NA	---	---	---	---	---	8.40E-10	NA
Mercury	194	NA	7.54E-07	NA	3.77E-05	NA	9.09E-04	---	---	---	---	---	NA	9.47E-04
Selenium	909	NA	2.11E-05	NA	7.04E-05	NA	9.77E-07	---	---	---	---	---	NA	9.26E-05
Silver	1,122	NA	7.83E-05	NA	8.69E-05	NA	2.40E-05	---	---	---	---	---	NA	1.89E-04
Antimony	2,513	NA	7.30E-05	NA	2.43E-03	NA	2.70E-06	---	---	---	---	---	NA	2.51E-03
Beryllium	849	6.06E-10	4.93E-06	2.02E-10	1.64E-06	6.24E-12	9.10E-09	---	---	---	---	---	8.14E-10	6.59E-06
Cobalt	6,613	NA	3.84E-04	NA	1.28E-04	5.67E-11	7.11E-05	---	---	---	---	---	5.67E-11	5.83E-04
Copper	11,748	NA	3.41E-06	NA	1.14E-04	NA	2.52E-06	---	---	---	---	---	NA	1.20E-04
Manganese	844,250	NA	2.10E-03	NA	2.34E-03	NA	3.69E-03	---	---	---	---	---	NA	8.13E-03
Nickel	17,715	NA	5.15E-07	NA	3.43E-05	1.30E-11	1.90E-05	---	---	---	---	---	1.30E-11	5.38E-05
Thallium	2,039	NA	2.96E-04	NA	9.87E-03	NA	1.56E-06	---	---	---	---	---	NA	1.02E-02
Zinc	36,425	NA	1.41E-06	NA	1.18E-05	NA	7.44E-09	---	---	---	---	---	NA	1.32E-05
Metals Total Risk		**8.79E-10**	**3.04E-03**	**8.67E-08**	**2.96E-02**	**1.07E-09**	**4.73E-03**		**NA**	**NA**	**NA**	**NA**	**8.87E-08**	**3.74E-02**
CUMULATIVE RISK		**8.31E-09**	**5.31E-03**	**1.69E-07**	**4.47E-02**	**1.95E-08**	**1.20E-02**		**1.87E-05**	**2.23E+00**	**2.49E-09**	**8.49E-01**	**1.89E-05**	**3.14E+00**

Notes:
NA: Not available
---: Risk evaluation was not performed.
HI: Hazard index
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter
GRO: Gasoline range organic
DRO: Diesel range organic
ORO: Oil range organic
TPH: Total petroleum hydrocarbon

Table 3C-12(a)

Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker

Sub-area 2C: Demolished Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc.	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	(ug/L)	IELCR	HQ		
Benzene	---	---	---	203	2.02E-08	2.02E-03	2.02E-08	2.02E-03
Organics Total Risk		**NA**	**NA**		**2.02E-08**	**2.02E-03**	**2.02E-08**	**2.02E-03**
TPH-GRO	13,000	NA	1.33E-04	73,658	NA	5.20E-01	NA	5.20E-01
TPH-DRO	1,330,000	NA	1.34E-03	513	NA	1.18E-01	NA	1.19E-01
TPH-ORO	34,000	NA	8.69E-07	429	NA	2.61E-01	NA	3.12E-01
TPH Total Risk		**NA**	**1.48E-03**		**NA**	**8.99E-01**	**NA**	**9.52E-01**
CUMULATIVE RISK		**NA**	**1.48E-03**		**2.02E-08**	**9.01E-01**	**2.02E-08**	**9.54E-01**

Notes:

NA: Not available

---: Risk evaluation was not performed.

HI: Hazard index

ug/kg: Micrograms per kilogram

ug/L: Micrograms per liter

GRO: Gasoline range organic

DRO: Diesel range organic

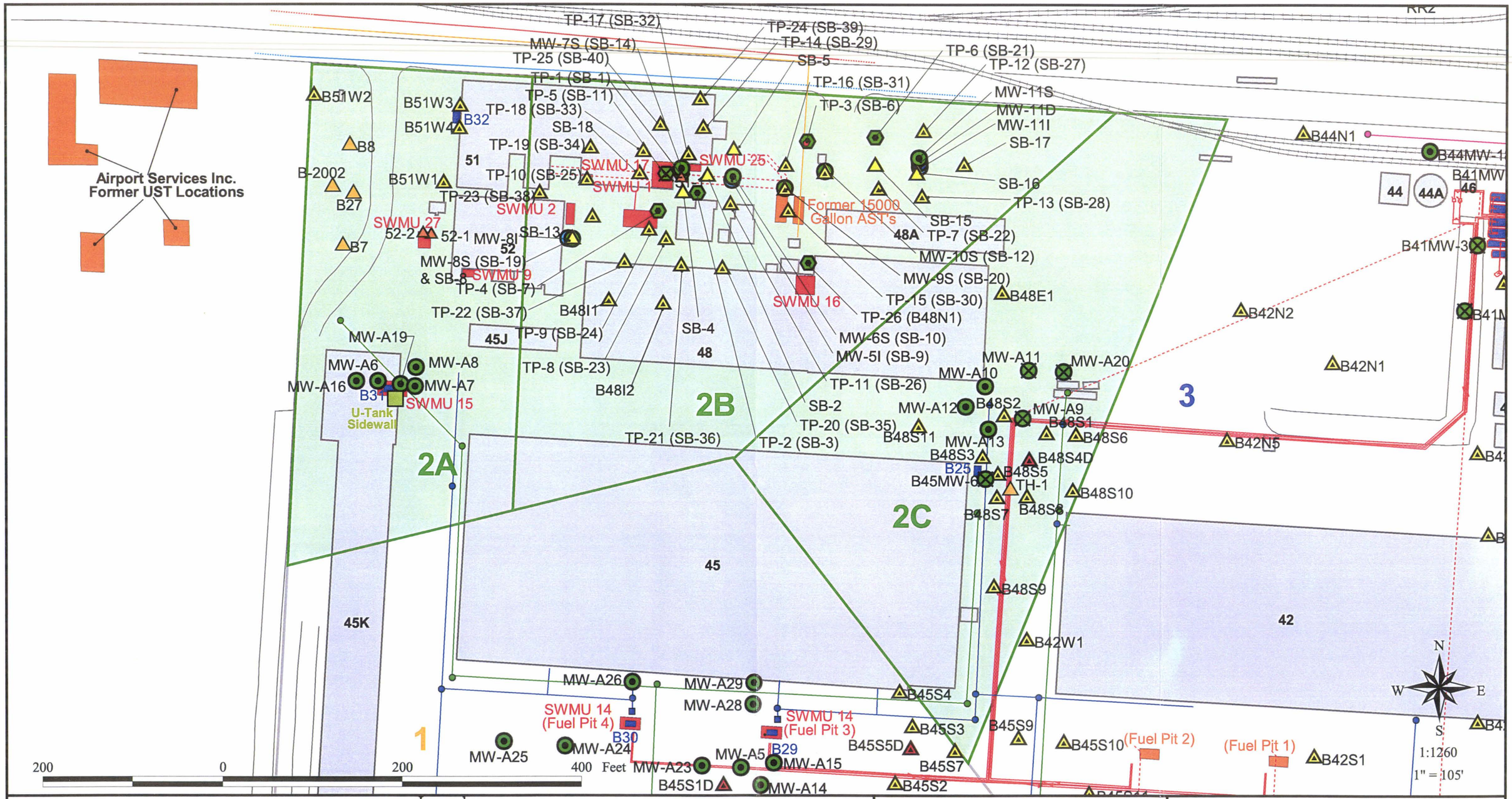
ORO: Oil range organic

TPH: Total petroleum hydrocarbon

Table 3C-12(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 2C: Demolished Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc.	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ	(ug/L)	IELCR	HQ	IELCR	HQ		
Benzene	102	1.48E-11	1.19E-05	1.64E-11	1.32E-05	8.40E-11	1.19E-04	203	3.91E-08	3.14E-02	4.83E-12	6.86E-06	3.92E-08	3.16E-02
Ethylbenzene	172	NA	6.01E-07	NA	6.14E-07	NA	5.37E-07	—	—	—	—	—	NA	1.75E-06
Methylene chloride	5.8	2.17E-13	3.37E-08	2.41E-13	3.75E-08	3.61E-13	1.79E-08	—	—	—	—	—	8.19E-13	8.91E-08
Toluene	762	NA	1.33E-07	NA	1.48E-06	NA	8.38E-06	—	—	—	—	—	NA	9.99E-06
Xylenes, Total	415	NA	2.41E-09	NA	2.01E-08	NA	1.65E-06	—	—	—	—	—	NA	1.67E-06
Organics Total Risk		**1.50E-11**	**1.27E-05**	**1.67E-11**	**1.54E-05**	**8.43E-11**	**1.30E-04**		**3.91E-08**	**3.14E-02**	**4.83E-12**	**6.86E-06**	**3.92E-08**	**3.16E-02**
TPH-GRO	97,167	NA	NA	NA	4.42E-04	NA	5.72E-04	73,658	NA	NA	NA	7.08E-03	NA	8.09E-03
TPH-DRO	177,313	NA	3.91E-04	NA	1.19E-03	NA	3.40E-04	513	NA	NA	NA	1.59E-03	NA	3.51E-03
TPH-ORO	15,167	NA	3.86E-05	NA	9.94E-05	NA	3.13E-06	429	NA	NA	NA	3.52E-03	NA	3.66E-03
TPH Total Risk		**NA**	**4.30E-04**	**NA**	**1.73E-03**	**NA**	**9.16E-04**		**NA**	**NA**	**NA**	**1.22E-02**	**NA**	**1.53E-02**
CUMULATIVE RISK		**1.50E-11**	**4.42E-04**	**1.67E-11**	**1.75E-03**	**8.43E-11**	**1.05E-03**		**3.91E-08**	**3.14E-02**	**4.83E-12**	**1.22E-02**	**3.92E-08**	**4.68E-02**

Notes:
NA: Not available
—: Risk evaluation was not performed.
HI: Hazard index
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter
GRO: Gasoline range organic
DRO: Diesel range organic
ORO: Oil range organic
TPH: Total petroleum hydrocarbon



Legend

- Abandoned Shallow Piezometer
- Abandoned Shallow Well
- Deep Piezometer
- Deep Well
- Intermediate Well
- Other Shallow Boring
- RFA Boring
- RCRA Closure Shallow Boring
- RFI Deep Boring/Temp. Piezometer
- RFI Shallow Boring
- RFI Shallow Boring/Temp. Piezometer
- Shallow Piezometer
- Shallow Well
- UST Closure Sample
- Other Area
- UST
- SWMU
- Industrial Sewer Line
- Sanitary Sewer Line
- Steam Line
- Storm Sewer Line
- Jet Fuel Line
- Natural Gas Line
- Water Line
- Abandoned Fuel Line
- Manhole (Type by Color)
- Storm Sewer Intake
- Storm Sewer Outlet

Drawn by: BSM Approved by:

Checked by: Date: September 10, 2004

Risk Assessment & Management Group, Inc.

Figure 3-1
Exposure Area 2:
Sub Areas 2A, 2B, & 2C,
Demolished Area,
Boeing Tract 1 South

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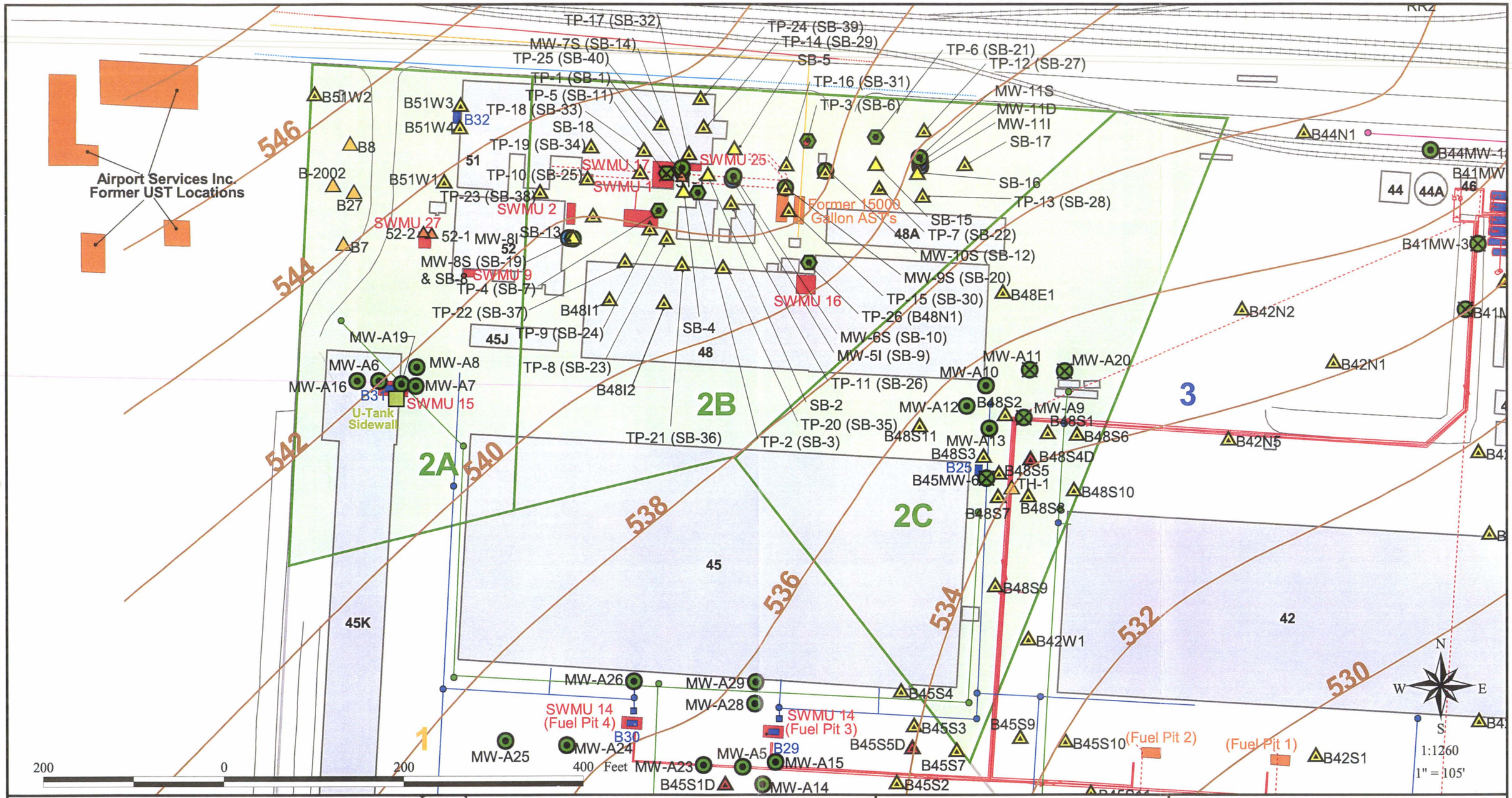

Legend

Abandoned Shallow Piezometer	RCRA Closure Shallow Boring	Other Area	Shallow Groundwater Isopleth
Abandoned Shallow Well	RFI Deep Boring/Temp. Piezometer	UST	Natural Gas Line
Deep Piezometer	RFI Shallow Boring	SWMU	Water Line
Deep Well	RFI Shallow Boring/Temp. Piezometer	Industrial Sewer Line	Abandoned Fuel Line
Intermediate Well	Shallow Piezometer	Sanitary Sewer Line	Manhole (Type by Color)
Other Shallow Boring	Shallow Well	Steam Line	Storm Sewer Intake
RFA Boring	UST Closure Sample	Storm Sewer Line	Storm Sewer Outlet
		Jet Fuel Line	

Drawn by: BSM Approved by:

Checked by: Date: September 10, 2004

Risk Assessment & Management Group, Inc.

Figure 3-2
Shallow Groundwater Isopleth Map for Area 2: Demolished Area, Boeing Tract 1 South

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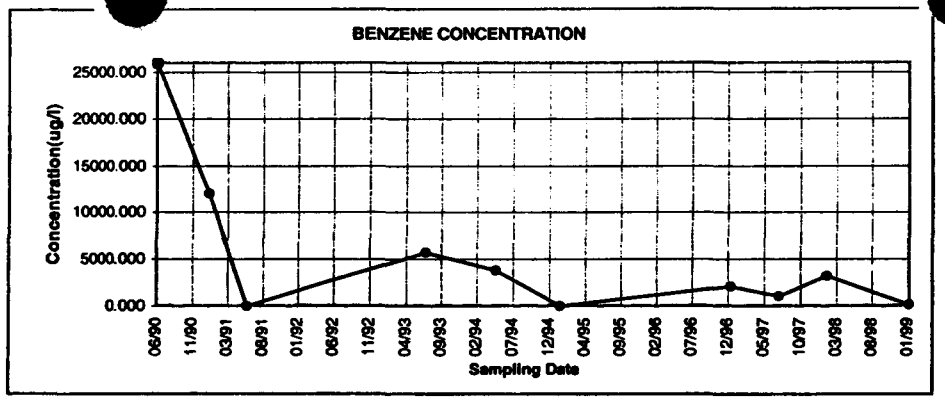
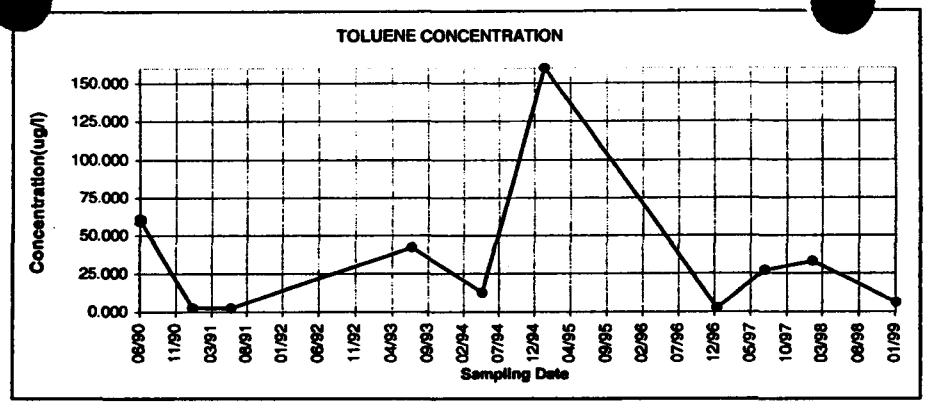
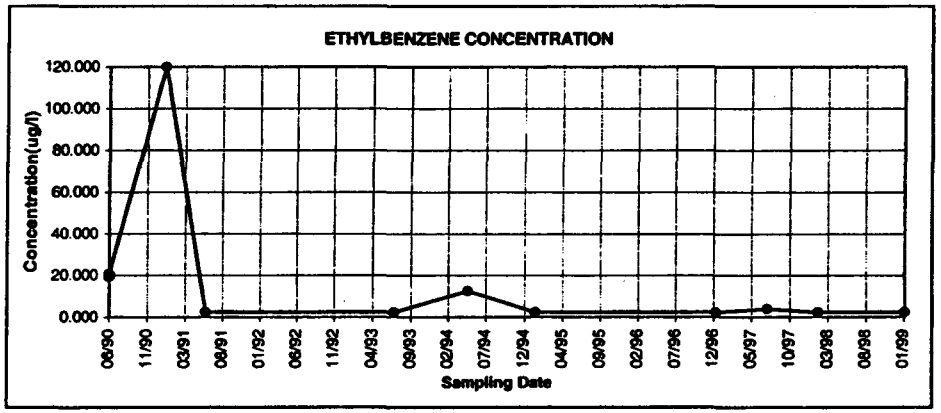
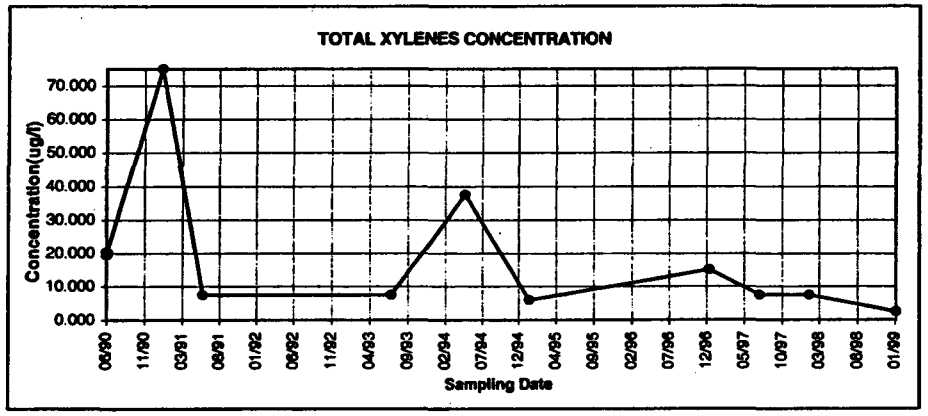
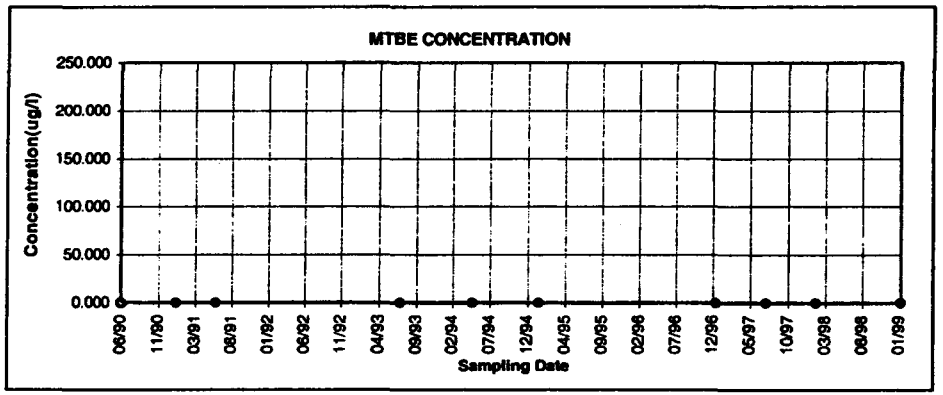
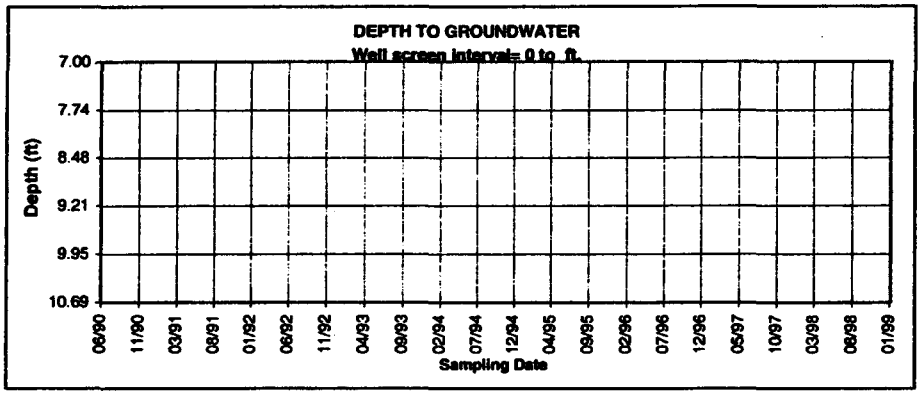












— — — — — = MCL/Groundwater standard/Average Groundwater Depth × = PSH

Note: PSH readings are plotted as the maximum value ever detected in the range. The point is plotted as "X" but not connected to adjacent points.

ND is assumed as zero concentration. The point is connected to the preceding and the following point by dotted line

Figure 3-3 Groundwater Data Collected at MW-A13

Sub-area 2A: Demolished Area, Boeing Tract 1, St. Louis, Missouri

ATTACHMENT 3-A

ECOLOGICAL RISK ASSESSMENT – AREA 2 DEMOLISHED AREA TIER 1 SCREENING CHECKLIST FOR POTENTIAL RECEPTORS AND HABITAT CHECKLIST #1

1. Is the site less than ½ mile to a surface water resource (pond, river, lake, etc.)?

   Yes. Coldwater Creek is located 2,500 feet from the edge of Area 2.

2. Are wetlands (e.g. marshes, swamps, fens) on or adjacent to the site?

   No.

3. Are contaminated soils uncovered or otherwise accessible to ecological receptors and the elements?

   No, the site is paved.

4. Has a process (operational) discharge or storm water permit not been issued for the site?

   Site-wide, there is a storm water permit.

5. Is the site located in a known Karst environment (see Reference map)?

   No.

6. Are there federal or state rare, threatened, or endangered species on or within a ½ mile radius of the site? Note, the ½ mile radius limit does not necessarily apply to situations where a hydrogeological connection exists between the site and karsitic features.

   No.

7. Are there one or more environmentally sensitive areas (see Ecological Risk Assessment Figure #1 for definition) at or within a ½ mile radius of the site?

   No.

8. Are commercially or recreationally important species (fauna or flora) on or within a ½ mile radius of the site?

   No.

ATTACHMENT 3-B

ECOLOGICAL RISK ASSESSMENT – AREA 2 DEMOLISHED AREA TIER 1 SCREENING CHECKLIST FOR POTENTIAL RECEPTORS AND HABITAT CHECKLIST #2

1a. Can contaminants associated with the site leach, dissolve, or otherwise migrate to groundwater?

Yes.

1b. Are contaminants associated with the site mobile in groundwater?

Yes.

1c. Does groundwater from the site discharge into to ecological receptor habitat?

Yes, eventually.

1. Could contaminants associated with the site reach ecological receptors via groundwater?

No, groundwater impact is delineated within the boundary of the area, and off-site migration is not anticipated.

2a. Is NAPL present at the site?

Yes.

2b. Is NAPL migrating?

No.

2c. Could NAPL discharge occur where ecological receptors are found?

No.

2. Could contaminants from the site reach ecological receptors via migration of NAPL?

No.

3a. Are contaminants present in surface soils?

Yes.

3b. Can contaminants be leached from or be transported by erosion of surface soils?

Yes, leaching of these contaminants to the groundwater is possible, however erosion of surface soils is unlikely as the site is paved.

3. Could contaminants reach ecological receptors via erosional transport of contaminated soil or via precipitation runoff?

No, the site is paved.

4a. Are contaminants present in surface soil or on the surface of the ground?

Yes.

4b. Are potential ecological receptors on the site?

No, the site is a large industrial site, almost entirely covered by either buildings or pavement.

4. Could contaminants reach ecological receptors via direct contact?

No.

5a. Are contaminants present on the site volatile?

Yes.

5b. Could contaminants on the site be transported in air as dust or particulate matter?

No, the site is entirely paved.

5. Could contaminants reach ecological receptors via inhalation of volatilized contaminants or contaminants adhered to dust in ambient air or in subsurface burrows?

No, the site is a large industrial site, almost entirely covered by either buildings or pavement.

6a. Are contaminants present in surface and shallow subsurface soils or on the surface of the ground?

Yes.

6b. Are contaminants found in soil on the site taken up by plants growing on the site?

No, there are no plants on-site, the site is entirely paved.

6c. Do potential ecological receptors on or near the site feed on plants found on the site?

No.

6d. Do contaminants found on the site bioaccumulate?

Yes, some metals.

6. Could contaminants reach ecological receptors via ingestion of either soil, plants, animals, or contaminants directly?

No.

7a. Are there Karsitic features on or within a ½ mile radius of the site?

No.

7b. Is there a hydrogeological connection between the site and karsitic features such as seeps, springs, streams, or other surface water bodies?

No.

7. Could contaminants reach ecological receptors via transport through a Karst system?

No.

Section
4.0

4.1 INTRODUCTION

The Retained Area (Area 3) is located within the southern portion of the Facility, adjacent to and south of the Norfolk and Western Railroad Company railroad tracks and Banshee Road (Figure 4-1). This Area is bounded on the west by Areas 1 and 2, on the south by the Airport runway, and on the east by Areas 4 and 9. This section will describe the chemicals found here, the exposure model, the evaluation of the current and future risk to human health and the environment, and conclusions based on the results of the risk evaluation.

4.2 DESCRIPTION OF AREA

The Retained Area is approximately 2,500 feet long by 1,200 feet wide (Figure 4-1). Within this Area are nine buildings, and a large parking lot. The Area is currently paved. Under future construction plans, the majority of the current buildings are due to be retained and the Area will continue to be paved. For the purposes of this risk evaluation, Area 3 was further subdivided into eight Sub-areas; 3A to 3H (Figure 4-1). A brief description of the Sub-areas follows:

- Sub-area 3A: This Sub-area is trapezoidal and located in the northwestern portion of Area 3 and covers about 5.25 acres. It extends from Banshee Road on the north to the northern edge of Building 42 on the south, and from Area 2C on the west to the middle of Building 41 on the east. This Sub-area contains the Building 41 tankfarm and the northern portion of the pipeline that extends from the Building 41 tank farm to the Fuel Pits #1, 2, 3, and 4. Also, included in this Sub-area are building/structures #44, #44A, #46, and #49, and along the northern perimeter are railroad spurs and an industrial sewer line. The primary chemicals that exceeded screening criteria in this Sub-area were VOCs, TPH, and metals.

- Sub-area 3B: This Sub-area is rectangular and located on the west side of the southern portion of Building #2 and covers about 0.68 acres. This Sub-area is bounded on the north by Sub-area 3D, on the west and south by Sub-area 3C, and on the east by Building #2. This Sub-area contains the previous Aviation Gas Refueling Station and past UST #B68. The primary chemicals that exceeded screening criteria in this Sub-area were VOCs and TPH.

- Sub-area 3C: This Sub-area is a 7-sided polygon in the southwestern portion of Area 3 and covers about 11.91 acres. This Sub-area is bounded on the north by Sub-areas 2A and 2B, on the west by Sub-area 2C and Area 1, on the south by the Airport runway, and on the east by other portions of Area 3. This Sub-area contains Buildings #3, #42, #43, and #45H, Fuel Pits #1 and #2, the previous Building #43 tankfarm and past USTs #B33 – B37, and associated pipelines connecting Fuel Pits #1 and #2 to the Building #41 and #43 tank farms, and connecting the two tankfarms together. The primary chemicals that exceeded screening criteria in this Sub-area were VOCs, TPH, and metals.

4.8.2 Sub-area 3B

Tables 4B-8(a) and 4B-8(b) present the representative concentrations for soil, and Table 4B-9 presents the representative concentrations for groundwater. The ratio of the maximum detected concentration to average concentration is also presented. For this Sub-area the ratio of maximum detected concentration to the average concentration did not exceed 10 for the COCs in soil or groundwater.

4.8.3 Sub-area 3C

Tables 4C-8(a) and 4C-8(b) present the representative concentrations for soil, and Table 4C-9 presents the representative concentrations for groundwater. The ratio of the maximum detected concentration to average concentration is also presented. Following are the constituents and the samples for which this ratio exceeds 10:

GROUNDWATER	
COCs	**Locations**
Benzene	B42S5W
TPH-DRO	B42S5W

Benzene was detected at concentrations below the acceptable HQ of 1 and the acceptable IELCR of 1×10^{-5}, refer Tables 4C-10(a) and 4C-10(b). Thus, the target risk will not exceed unacceptable levels. However, to be conservative, we have identified those constituents whose concentrations are within two orders of magnitude of acceptable risk (i.e., those chemicals with an IELCR $>1 \times 10^{-7}$ and/or HQ > 0.01 for any receptor).

Based on this comparison, two constituents in groundwater, benzene and TPH-DRO, in the vicinity of B42S5W are within two orders of magnitude of acceptable risk.

4.8.4 Sub-area 3D

Tables 4D-8(a) and 4D-8(b) present the representative concentrations for soil, and Table 4D-9 presents the representative concentrations for groundwater. The ratio of the maximum detected concentration to average concentration is also presented. For this Sub-area the ratio of maximum detected concentration to the average concentration did not exceed 10 for the COCs in soil or groundwater.

4.8.5 Sub-area 3E

Tables 4E-8(a) and 4E-8(b) present the representative concentrations for soil, and Table 4E-9 presents the representative concentrations for groundwater. The ratio of the maximum detected concentration to average concentration is also presented. For this Sub-area the ratio of maximum detected concentration to the average concentration did not exceed 10 for the COCs in soil or groundwater.

4.8.6 Sub-area 3F

Tables 4F-8(a) and 4F-8(b) present the representative concentrations for soil, and Table 4F-9 presents the representative concentrations for groundwater. The ratio of the maximum detected

concentration to average concentration is also presented. For this Sub-area the ratio of maximum detected concentration to the average concentration did not exceed 10 for the COCs in soil or groundwater.

4.8.7 Sub-area 3G

Tables 4G-8(a) and 4G-8(b) present the representative concentrations for soil, and Table 4G-9 presents the representative concentrations for groundwater. The ratio of the maximum detected concentration to average concentration is also presented. For this Sub-area the ratio of maximum detected concentration to the average concentration did not exceed 10 for the COCs in soil or groundwater.

4.8.8 Sub-area 3H

Tables 4H-8(a) and 4H-8(b) present the representative concentrations for soil, and Table 4H-9 presents the representative concentrations for groundwater. The ratio of the maximum detected concentration to average concentration is also presented. For this Sub-area the ratio of maximum detected concentration to the average concentration did not exceed 10 for the COCs in soil or groundwater.

4.9 CALCULATION OF RISK

Series of Tables 4-10(a) and 4-10(b) present the results for the non-residential worker and construction worker, respectively. The tables present the carcinogenic (IELCR) and non-carcinogenic (HQ and HI) risks for:

- Each COC,
- Each route of exposure,
- Cumulative risk for each COC,
- Cumulative risk for each route of exposure, and
- Total risk which is the sum of risk for all the COCs and all the routes of exposures.

Based on these tables, following are the key observations.

4.9.1 Sub-area 3A

4.9.1.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 4A-10(a), the cumulative IELCR is 7.9×10^{-8}, which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 4A-10(a), the cumulative HI for all COCs and all routes of exposure is 2.6, which exceeds the regulatory acceptable level of 1.0. Further examination of the table indicates that the primary contributors to HI are HQs for indoor inhalation of TPH-DRO from

groundwater. The contribution to the HI from all the other COCs and routes of exposure is significantly less than 1.0.

4.9.1.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 4A-10(b), the cumulative IELCR is 4.52×10^{-8}, which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 4A-10(b), the cumulative HI is 0.055, which is below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1.0, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

4.9.2 Sub-area 3B

4.9.2.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 4B-10(a), the cumulative IELCR is 3.35×10^{-9}, which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 4B-10(a), the cumulative HI for all COCs and all routes of exposure is 0.31, which is below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1.0, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

4.9.2.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 4B-10(b), the cumulative IELCR is 4.66×10^{-10}, which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 4B-10(b), the cumulative HI is 0.0071, which is well below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1.0, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

4.9.3 Sub-area 3C

4.9.3.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 4C-10(a), the cumulative IELCR is 2.0×10^{-8}, which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 4C-10(a), the cumulative HI for all COCs and all routes of exposure is 77, which exceeds the regulatory acceptable level of 1.0. Further examination of the table indicates that the primary contributors to HI are HQs for indoor inhalation of TPH-DRO and TPH-ORO from groundwater. The contribution to the HI from all the other COCs and routes of exposure is significantly less than 1.0.

4.9.3.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 4C-10(b), the cumulative IELCR is 2.34×10^{-8}, which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 4C-10(b), the cumulative HI is 1.29, which exceeds the regulatory acceptable level of 1.0. Further examination of the table indicates that the primary contributor to HI is HQ for indoor inhalation of TPH-DRO from groundwater. This is 0.95, i.e., the contribution to the HI from all the other COCs and routes of exposure is significantly less than 1.0.

4.9.4 Sub-area 3D

4.9.4.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 4D-10(a), the cumulative IELCR is 2.93×10^{-8}, which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 4D-10(a), the cumulative HI for all COCs and all routes of exposure is 0.075, which is well below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1.0, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

4.9.4.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 4D-10(b), the cumulative IELCR is 1.17×10^{-7}, which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 4D-10(b), the cumulative HI is 0.048, which is below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1.0, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

4.9.5 Sub-area 3E

4.9.5.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 4E-10(a), the cumulative IELCR is 4.31×10^{-8}, which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 4E-10(a), the cumulative HI for all COCs and all routes of exposure is 10, which exceeds the regulatory acceptable level of 1.0. Further examination of the table indicates that the primary contributors to HI are HQs for indoor inhalation of aliphatics >nC12 to nC16 and aliphatics >nC16 to nC21 from groundwater. These are 0.93 and 8.8, respectively; therefore, the contribution to the HI from all the other COCs and routes of exposure is significantly less than 1.0.

4.9.5.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 4E-10(b), the cumulative IELCR is 8.02×10^{-10}, which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 4E-10(b), the cumulative HI is 0.12, which is below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1.0, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

4.9.6 Sub-area 3F

4.9.6.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 4F-10(a), the cumulative IELCR is not available.

Non-carcinogenic Risk:

As shown in Table 4F-10(a), the cumulative HI for all COCs and all routes of exposure is 0.86, which is below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1.0, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

4.9.6.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 4F-10(b), the cumulative IELCR is not available.

Non-carcinogenic Risk:

As shown in Table 4F-10(b), the cumulative HI is 0.0082, which is well below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1.0, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

4.9.7 Sub-area 3G

4.9.7.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 4G-10(a), the cumulative IELCR is 6.02×10^{-8}, which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 4G-10(a), the cumulative HI for all COCs and all routes of exposure is 2.8, which exceeds the regulatory acceptable level of 1.0. Further examination of the table indicates that the primary contributors to HI are HQs for indoor inhalation of aliphatics >nC21 to nC35 from groundwater. The contribution to the HI from all the other COCs and routes of exposure is significantly less than 1.0.

4.9.7.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 4G-10(b), the cumulative IELCR is 9.38 x 10^{-8}, which is well below the regulatory acceptable level of 1 x 10^{-4}. Since the cumulative risk is less than 1 x 10^{-5}, clearly the risk for each COC and routes of exposure is less than 1 x 10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 4G-10(b), the cumulative HI is 0.12, which is below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1.0, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

4.9.8 Sub-area 3H

4.9.8.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 4H-10(a), the cumulative IELCR is not available.

Non-carcinogenic Risk:

As shown in Table 4H-10(a), the cumulative HI for all COCs and all routes of exposure is 0.7, which is below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1.0, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

4.9.8.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 4H-10(b), the cumulative IELCR is 6.35 x 10^{-13}, which is well below the regulatory acceptable level of 1 x 10^{-4}. Since the cumulative risk is less than 1 x 10^{-5}, clearly the risk for each COC and routes of exposure is less than 1 x 10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 4H-10(b), the cumulative HI is 0.0058, which is well below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1.0, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

4.10 ECOLOGICAL RISK

The only potential ecological receptor in the area is Coldwater Creek, which flows north about 550 feet to the northeast of Area 3. There are no known unpermitted conduits present that could carry impacts from Area 3 to Coldwater Creek. Considering the geology, groundwater flow characteristics and the chemical types and concentrations of impacts in Area 3, it is not likely that migration of impacts from Area 3 to Coldwater Creek will occur. The Tier 1 ecological screening

checklists have been completed for this Area, and are presented as Attachment 4-A and Attachment 4-B. These checklists identified no potential ecological receptors or issues.

4.11 CONCLUSIONS

Carcinogenic and non-carcinogenic risks to the non-residential worker and construction worker were calculated for each Sub-area. Key conclusions of the risk evaluation are:

Sub-area 3A

The cumulative non-carcinogenic risk for the non-residential worker exceeded the target risk. The primary contributor to the risk was indoor inhalation of vapor from TPH-DRO in groundwater. The calculated carcinogenic risk for the non-residential worker was below the acceptable target risk.

The calculated risks for all COCs and all potentially complete routes of exposure for the construction worker are below the regulatory acceptable level.

Sub-area 3B

The calculated risks for all the COCs and all potentially complete routes of exposure for the non-residential worker and the construction worker are below the acceptable target risks.

Sub-area 3C

The cumulative non-carcinogenic risk for the non-residential worker exceeded the target risk. The primary contributor to the risk was indoor inhalation of vapor from TPH-DRO in groundwater.

The cumulative non-carcinogenic risk for the construction worker exceeded the target risk. The primary contributor to the risk was outdoor inhalation of TPH-DRO from groundwater.

The calculated carcinogenic risk for the non-residential worker and the construction worker was below the acceptable target risk.

Sub-area 3D

The calculated risks for all the COCs and all potentially complete routes of exposure for the non-residential worker and the construction worker are below the acceptable target risks.

Sub-area 3E

The cumulative non-carcinogenic risk for the non-residential worker exceeded the target risk. The primary contributor to the risk was indoor inhalation of vapor from aliphatics >nC12 to nC16 and aliphatics >nC16 to nC21 in groundwater.

The calculated risks for all COCs and all potentially complete routes of exposure for the construction worker are below the regulatory acceptable level.

Sub-area 3F

The cumulative carcinogenic risk is not a concern for the non-residential worker and the construction worker in this Sub-area. The calculated non-carcinogenic risks for all COCs and all potentially complete routes of exposure for the non-residential worker and the construction worker are below the regulatory acceptable level.

Sub-area 3G

The cumulative non-carcinogenic risk for the non-residential worker exceeded the target risk. The primary contributor to the risk was indoor inhalation of vapor from aliphatics >nC12 to nC35 in groundwater.

The calculated risks for all COCs and all potentially complete routes of exposure for the construction worker are below the regulatory acceptable level.

Sub-area 3H

The cumulative carcinogenic risk is not a concern for the non-residential worker and the construction worker in this Sub-area. The calculated non-carcinogenic risks for all COCs and all potentially complete routes of exposure for the non-residential worker and the construction worker are below the regulatory acceptable level.

Table 4-1
Summary of Underground Storage Tanks (USTs) Present Historically within Area 3: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sub-area	UST Number	Location	Volume (Gallons)	Contents	Construction Materials	Year Installed	Status	Comments
3A	B1	Building 41	4000	T-979 Solvent	Single Wall Steel	1947	Removed 1981	Excavated
3A	B2	Building 41	4000	Lacquer Thinner	Single Wall Steel	1947	Removed 1981	Excavated
3A	B3	Building 41	8000	Aviation Gas	Single Wall Steel	1947	Removed 1981	Excavated
3A	B4	Building 41	8000	Gasoline	Single Wall Steel	1947	Removed 1981	Excavated
3A	B5	Building 41	4000	JP-5	Single Wall Steel	1981	Removed 1989	Excavated
3A	B6	Building 41	15000	JP-4	Single Wall Steel	1947	Removed 1957	Excavated
3A	B7	Building 41	15000	JP-4	Single Wall Steel	1947	Removed 1957	Excavated
3A	B8	Building 41	15000	JP-4	Single Wall Steel	1948	Removed 1989	Excavated
3A	B9	Building 41	15000	JP-4	Single Wall Steel	1948	Removed 1989	Excavated
3A	B10	Building 41	15000	JP-4	Single Wall Steel	1957	Removed 1989	Excavated
3A	B11	Building 41	15000	JP-4	Single Wall Steel	1957	Removed 1989	Excavated
3A	B12	Building 41	8000	Gasoline	Fiberglass / Plastic	1981	Removed 1989	Excavated
3A	B13	Building 41	8000	JP-5	Fiberglass / Plastic	1981	Removed 1989	Excavated
3A	B14	Flight Ops / A-41	30000	Jet Fuel	Double Wall Fiberglass	1989	Active	
3A	B15	Flight Ops / B-41	30000	Jet Fuel	Double Wall Fiberglass	1989	Active	
3A	B16	Flight Ops / C-41	30000	Jet Fuel	Double Wall Fiberglass	1989	Active	
3A	B17	Flight Ops / D-41	30000	Jet Fuel	Double Wall Fiberglass	1989	Active	
3A	B18	Company Vehicles / E-41	8000	Gasoline	Double Wall Fiberglass	1989	Active	
3A	B19	Flight Ops / F-41	8000	Water	Double Wall Fiberglass	1989	Current / Not in use	
3B	B68	Building 42	Unknown	Aviation Gas	Single Wall Fiberglass	Unknown	Removed Date Unknown	Excavated
3C	B33	Bldg. 43 Fuel Farm	20000	Jet Fuel	Single Wall Steel	1957	Removed 1991	Excavated *
3C	B34	Bldg. 43 Fuel Farm	20000	Jet Fuel	Single Wall Steel	1957	Removed 1991	Excavated *
3C	B35	Bldg. 43 Fuel Farm	20000	Jet Fuel	Single Wall Steel	1957	Removed 1991	Excavated *
3C	B36	Bldg. 43 Fuel Farm	20000	Jet Fuel	Single Wall Steel	1957	Removed 1991	Excavated *
3C	B37	Bldg. 43 Fuel Farm	20000	Jet Fuel	Single Wall Steel	1957	Removed 1991	Excavated *
3E	B24	Building 2	1000	Gasoline / Diesel	Single Wall Steel	1942	Removed 1989	Excavated
3F	B20	Building 1	500	Gasoline	Single Wall Steel	1956	Removed 1961	Excavated
3F	B21	Building 1	500	Gasoline	Single Wall Steel	1961	Removed 1972	Excavated
3G	B22	Building 1	6000	Diesel	Single Wall Steel	1972	Removed 1980	Excavated
3G	B23	Building 1	5000	Gasoline	Single Wall Steel	1941	Removed 1989	Excavated
3H	B41	Building 5	15000	Fuel Oil	Single Wall Steel	1941	Removed 1988	Excavated
3H	B42	Building 5	15000	Fuel Oil	Single Wall Steel	1941	Removed 1988	Excavated
3H	B43	Building 5	6000	Fuel Oil	Single Wall Steel	1941	Removed 1988	Excavated

Note:
*: During excavation, 799 cubic yards of soil were also removed.

Table 4-2
Soil Boring Information for Area 3: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sub Area	Boring	Date Drilled	Sub Area	Boring	Date Drilled
3A	B41N1	11/8/2002	3C	B45S9	11/19/2002
3A	B41S1	11/7/2002	3D	2-10024	11/1/1994
3A	B41S3D	11/7/2002	3D	B2I1	11/8/2002
3A	B42N1	7/1/2003	3D	B2I2	6/30/2003
3A	B42N2	7/23/2003	3D	B2N1	11/11/2002
3A	B42N3	7/23/2003	3D	B2N2	11/11/2002
3A	B42N4	7/23/2003	3D	B2N3	11/12/2002
3A	B42N5	7/23/2003	3D	B2N4	11/13/2002
3A	B44N1	11/8/2002	3D	B2N6	7/24/2003
3B	B42E1	7/1/2003	3D	B2N7	7/24/2003
3B	B42E2	7/22/2003	3D	B2W1	11/8/2002
3B	B42E3	7/22/2003	3D	B41E1	11/12/2002
3C	B42S1	11/19/2002	3D	B41S2	11/7/2002
3C	B42S2	6/30/2003	3D	B41S4	11/13/2002
3C	B42S3	7/22/2003	3E	B2E1	7/1/2003
3C	B42S4	7/22/2003	3E	B2E2	7/24/2003
3C	B42S5	7/22/2003	3E	B2N5	11/13/2002
3C	B42S6	7/22/2003	3F	B1W1	7/1/2003
3C	B42S7	7/23/2003	3F	B1W2	7/24/2003
3C	B42W1	6/30/2003	3G	B2S1	7/1/2003
3C	B45S10	11/19/2002	3G	B2S2	7/24/2003
3C	B45S11	6/30/2003	3H	B4E1	11/21/2002
3C	B45S12	6/30/2003	3H	B4E2D	11/22/2002
3C	B45S8	11/19/2002	3H	B4E3	7/24/2003

Table 4-3
Monitoring Well Information within Area 3: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sub-area	Monitoring Well	Diameter (inches)	Screened Interval (ft bgs)	Total Depth (feet)	Installation Date	Status	# of Times Sampled
3A	B41MW-18	2	2-12	12	11/8/1988	Active	1
3A	B41MW-4	2	2-12	12	10/26/1988	Inactive	1
3C	MW-A4	2	2-12	12	7/13/1989	Inactive	1
3D	B41MW-5	2	2-12	12	10/26/1988	Active	2
3D	B41MW-7	2	2-12	12	10/28/1988	Active	1
3H	B4MW-10	2	2-12	12	11/22/1988	Active	1*
3H	B4MW-9	2	10-19.8	19.8	11/2/1988	Active	0
3H	B5MW-22	2	5-14.6	14.6	11/10/1988	Active	2

Notes:
NA: Not available
ft bgs: Feet below ground surface
* Sampled once at installation for TRPH only, Burns and Mac report 1989. Not used due to lab method.

Ta

Soil Samples Used in Average Concentration Calculations in Area 3: Retained Area
Boeing Tract 1, St. Louis, Missouri

	Volatile Organic Compounds		Total Petroleum Hydrocarbons		Polynuclear Aromatic Hydrocarbons		Polychlorinated Biphenyls		Metals	
	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker
3A	B41S3D-4	B41N1-8	B41S3D-4	B41S3D-4	B41S3D-4	B41N1-8			B42N3-4	B42N2-12
	B42N3-4	B41S3D-4		B42N1-9		B41S1-6				B42N3-4
		B42N2-12		B42N5-6		B41S3D-4				B42N4-8
		B42N3-4								B42N5-6
		B42N4-8								B44N1-9
		B42N5-6								
		B44N1-9								
3B	B42E3-4	B42E1-5	B42E3-4	B42E1-5					B42E3-4	B42E2-8
		B42E2-8		B42E2-8						B42E3-4
		B42E3-4		B42E3-4						
3C		B42S2-5		B42S2-5						B42S3-9
		B42S5-8		B42S5-8						B42S4-6
		B42S6-5		B42S6-5						B42S5-8
		B42S7-8		B42W1-5						B42S6-5
		B45S10-6		B45S10-6						B42S7-8
		B45S11-6		B45S11-6						
				B45S12-6						
				B45S8-6						
3D	2-10024 0-2	2-10024 0-2	B2N7-6	B2N7-6		B41E1-10			2-10024 (0-2)	2-10024 (0-2)
	B2N4-6	B2I1-8	B2W1-6	B2W1-6					B2N6-6	B2I1-8
	B2W1-6	B2N3-8							B2N7-6	B2N1-8
		B2N4-6							B2W1-6	B2N2-8
		B2W1-6								B2N3-8
										B2N6-6
										B2N7-6
										B2W1-6
3E	B2E1-7	B2E1-7	B2E1-7	B2E1-7					B2E2-8	B2E2-8
	B2E2-8	B2E2-8	B2E2-8	B2E2-8						
3F										B1W2-8
3G	B2S2-7	B2S2-7	B2S2-7	B2S2-7					B2S2-7	B2S2-7
3H		B4E1-14		B4E1-14						B4E3-18
		B4E3-18		B4E2D-10						
				B4E3-18						

Note:
- analysis type not performed

Table 4A-5(a)
Soil Constituents Average Concentrations for VOCs in Sub-area 3A: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)											
	1,2,4-TRIMETHYLBENZENE	1,3,5-TRIMETHYLBENZENE	BENZENE	ETHYLBENZENE	ISOPROPYL BENZENE	M,P-XYLENE	METHYLENE CHLORIDE	N-PROPYLBENZENE	P-ISOPROPYLTOLUENE	SEC-BUTYLBENZENE	TOLUENE	XYLENES, TOTAL
Non- Residential Worker												
B41S3D-4	51	192	18	10	29	27	2.5	2.5	116	2.5	26	NA
B42N3-4	2.5	2.5	1.75	3.05	2.5	2.5	5.4	2.5	2.5	2.5	3.1	6.7
Average Concentration - Only Samples With VOC Detections	26.75	97.25	9.875	6.53	15.75	14.75	3.95		59.25		14.55	6.70
Construction Worker												
B41N1-8	2.5	2.5	186	2.5	11	21	2.5	2.5	2.5	75	2.5	NA
B41S3D-4	51	192	18	10	29	27	2.5	2.5	116	2.5	26	NA
B42N2-12	2.5	2.5	1.75	1.75	2.5	2.5	5.3	2.5	2.5	2.5	2.8	5.4
B42N3-4	2.5	2.5	1.75	3.05	2.5	2.5	5.4	2.5	2.5	2.5	3.1	6.7
B42N4-8	2.5	2.5	1.75	1.75	2.5	2.5	5.6	2.5	2.5	2.5	2.55	2.5
B42N5-6	12.5	12.5	8.75	51.75	80	12.5	29	110	12.5	91	17.75	64
B44N1-9	2.5	2.5	41	2.5	2.5	11	2.5	13	7.1	7.2	2.5	NA
Average Concentration - Only Samples With VOC Detections	10.857	31.00	37	10.471	18.571	11.286	7.54	19.357	20.8	26.171	8.17	19.65

Notes:
ug/kg - micrograms per kilogram
* - Hand auger samples from below Building 220 floor slab
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
VOCs - Volatile Organic Compounds
NA - Not Analyzed

Table 4A-5(b)
Soil Constituents Average Concentrations for TPHs
in Sub-area 3A: Retained Area
Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B41S3D-4	Overall Area Average (ug/kg)
TPH - DRO		**TPH - DRO**
11/7/2002	**24,000**	
11/8/2002	NA	
7/1/2003	NA	
7/23/2003	NA	
AVERAGE TPH - DRO	**24,000**	**24,000**
TPH - GRO		**TPH - GRO**
7/1/2003	NA	
7/23/2003	NA	
AVERAGE TPH - GRO		
TPH - ORO		**TPH - ORO**
11/7/2002	**2,500**	
11/8/2002	NA	
7/1/2003	NA	
7/23/2003	NA	
AVERAGE TPH - ORO	**2,500**	**2,500**

Notes:
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 4A-5(b)
Soil Constituents Average Concentrations for TPHs in Sub-area 3A:
Retained Area, Construction Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B41S3D-4	B42N1-9	B42N5-6	Overall Area Average (ug/kg)
TPH - DRO				TPH - DRO
11/7/2002	**24,000**	NA	NA	
11/8/2002	NA	NA	NA	
7/1/2003	NA	2,500	NA	
7/23/2003	NA	NA	**9,510**	
AVERAGE TPH - DRO	24,000	2,500	9,510	12,003
TPH - GRO				TPH - GRO
7/1/2003	NA	**7,000**	NA	
7/23/2003	NA	NA	**6,540**	
AVERAGE TPH - GRO		7,000	6,540	6,770
TPH - ORO				TPH - ORO
11/7/2002	2,500	NA	NA	
11/8/2002	NA	NA	NA	
7/1/2003	NA	2,500	NA	
7/23/2003	NA	NA	3,141	
AVERAGE TPH - ORO	2,500	2,500	3,141	2,714

Notes:
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 4A-5(c)
Soil Constituents Average Concentrations for Metals in Sub-area 3A:
Retained Area, Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)				
	ARSENIC	BARIUM	CHROMIUM	LEAD	MERCURY
B42N3-4	NA	NA	NA	8,690	NA
Average Concentration - Only Samples With Metals Detections				8,690	

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 4A-5(c)
Soil Constituents Average Concentrations for Metals in Sub-area 3A:
Retained Area, Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)				
	ARSENIC	BARIUM	CHROMIUM	LEAD	MERCURY
B42N2-12	NA	NA	NA	11,200	NA
B42N3-4	NA	NA	NA	8,690	NA
B42N4-8	NA	NA	NA	8,460	NA
B42N5-6	NA	NA	NA	7,120	NA
B44N1-9	2,000	110,000	13,000	10,000	94
Average Concentration - Only Samples With Metals Detections	2,000	110,000	13,000	9,094	94

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 4B-5(a)
Soil Constituents Average Concentrations for VOCs in Sub-area 3B: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)								
	ACETONE	BENZENE	CARBON DISULFIDE	ETHYLBENZENE	ISOPROPYL BENZENE	N-PROPYLBENZENE	SEC-BUTYLBENZENE	TOLUENE	XYLENES, TOTAL
Non- Residential Worker									
B42E3-4	19	54.75	3	14.25	4	2.9	5.7	5.55	58
Average Concentration - Only Samples With VOC Detections	19	54.75	3	14.25	4	2.9	5.7	5.55	58
Construction Worker									
B42E1-5	NA	1,170	NA	25	NA	NA	NA	398	731
B42E2-8	10	18.65	5	56.25	2.5	2.5	9.7	15.25	58
B42E3-4	19	54.75	3	14.25	4	2.9	5.7	5.55	58
Average Concentration - Only Samples With VOC Detections	14.5	414.47	4	31.833	3.25	2.7	7.7	139.6	282.33

Notes:
ug/kg - micrograms per kilogram
* - Hand auger samples from below Building 220 floor slab
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
VOCs - Volatile Organic Compounds
NA - Not Analyzed

Table 4B-5(b)
Soil Constituents Average Concentrations for TPHs
in Sub-area 3B: Retained Area
Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B42E3-4	Overall Area Average (ug/kg)
TPH - DRO		**TPH - DRO**
7/1/2003	NA	
7/22/2003	2,080.5	
AVERAGE TPH - DRO	2,080.5	**2,081**
TPH - GRO		**TPH - GRO**
7/1/2003	NA	
7/22/2003	**29,200**	
AVERAGE TPH - GRO	29,200	**29,200**
TPH - ORO		**TPH - ORO**
7/1/2003	NA	
7/22/2003	3,121	
AVERAGE TPH - ORO	3,121	**3,121**

Notes:
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 4B-5(b)
Soil Constituents Average Concentrations for TPHs in Sub-area 3B:
Retained Area, Construction Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B42E1-5	B42E2-8	B42E3-4	Overall Area Average (ug/kg)
TPH - DRO				**TPH - DRO**
7/1/2003	2,500.0	NA	NA	
7/22/2003	NA	**29,960.0**	2,080.5	
AVERAGE TPH - DRO	2,500.0	29,960.0	2,080.5	**11,514**
TPH - GRO				**TPH - GRO**
7/1/2003	**311,000**	NA	NA	
7/22/2003	NA	**11,800**	**29,200**	
AVERAGE TPH - GRO	311,000	11,800	29,200	**117,333**
TPH - ORO				**TPH - ORO**
7/1/2003	2,500	NA	NA	
7/22/2003	NA	3,169	3,121	
AVERAGE TPH - ORO	2,500	3,169	3,121	**2,930**

Notes:
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 4B-5(c)
Soil Constituents Average Concentrations for Metals in Sub-area 3B: Retained Area, Non-Residential Worker Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)
	LEAD
B42E3-4	14,600
Average Concentration - Only Samples With Metals Detections	14,600

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 4B-5(c)
Soil Constituents Average Concentrations for Metals in Sub-area 3B: Retained Area, Construction Worker Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)
	LEAD
B42E2-8	10,200
B42E3-4	14,600
Average Concentration - Only Samples With Metals Detections	12,400

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 4B-7(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 3B: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)						
	ACETONE	ISOPROPYL BENZENE	METHYLENE CHLORIDE	NAPHTHALENE	N-PROPYLBENZENE	SEC-BUTYLBENZENE	XYLENES, TOTAL
B42E1W	NA	NA	NA	NA	NA	NA	52.1
B42E2W	10	2.5	3	5	2.5	2.5	2.5
B42E3W	13	5.65	6.75	8.7	6.1	2.55	2.5
Average Concentration - Only Samples With VOC Detections	**13**	**5.65**	**6.75**	**8.7**	**6.1**	**2.55**	**27.3**

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed
No VOCs except methylene chloride detected in the sample

Table 4C-5(a)
Soil Constituents Average Concentrations for VOCs in Sub-area 3C: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)										
	ACETONE	BENZENE	ISOPROPYL BENZENE	METHYL TERT-BUTYL ETHER	METHYLENE CHLORIDE	N-BUTYLBENZENE	N-PROPYLBENZENE	SEC-BUTYLBENZENE	T-BUTYLBENZENE	TOLUENE	XYLENES, TOTAL
Non- Residential Worker											
Average Concentration - Only Samples With VOC Detections											
Construction Worker											
B42S2-5	NA	76	NA	12.5	NA	NA	NA	NA	NA	452	225
B42S5-8	42	38	47	27.5	50	59	84	62	12	26.75	310
B42S6-5	44	1.75	2.5	3	10	5.7	2.5	6.9	2.5	3.35	42
B42S7-8	10	1.75	2.5	5.4	5.4	2.5	2.5	2.5	2.5	2.6	2.5
B45S10-6	NA	62	NA	25	NA	NA	NA	NA	NA	952	513
B45S11-6	NA	293	NA	12.5	NA	NA	NA	NA	NA	2,500	463
Average Concentration - Only Samples With VOC Detections	32	78.75	17.333	14.317	21.8	22.4	29.667	23.8	5.6667	656.12	259.25

Notes:
ug/kg - micrograms per kilogram
* - Hand auger samples from below Building 220 floor slab
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
VOCs - Volatile Organic Compounds
NA - Not Analyzed

Table 4C-5(b)
Soil Constituents Average Concentrations for TPHs
in Sub-area 3C: Retained Area
Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	None	Overall Area Average (ug/kg)
TPH - DRO		**TPH - DRO**
11/19/2002		
6/30/2003		
7/22/2003		
7/23/2003		
AVERAGE TPH - DRO		
TPH - GRO		**TPH - GRO**
11/19/2002		
6/30/2003		
7/22/2003		
7/23/2003		
AVERAGE TPH - GRO		
TPH - ORO		**TPH - ORO**
11/19/2002		
6/30/2003		
7/22/2003		
7/23/2003		
AVERAGE TPH - ORO		

Notes:
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 4C-5(b)
Soil Constituents Average Concentrations for TPHs in Sub-area 3C: Retained Area, Construction Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B42S2-5	B42S5-8	B42S6-5	B42W1-5	B45S10-6	B45S11-6	B45S12-6	B45S8-6	Overall Area Average (ug/kg)
TPH - DRO									**TPH - DRO**
11/19/2002	NA	NA	NA	NA	2,500	NA	NA	2,500	
6/30/2003	**925,000**	NA	NA	**57,000**	NA	**972,000**	**127,000**	NA	
7/22/2003	NA	**5,320**	**399,000**	NA	NA	NA	NA	NA	
7/23/2003	NA	NA	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - DRO	925,000	5,320	399,000	57,000	2,500	972,000	127,000	2,500	**311,290**
TPH - GRO									**TPH - GRO**
11/19/2002	NA	NA	NA	NA	**103,000**	NA	NA	**21,000**	
6/30/2003	**54,000**	NA	NA	2,500	NA	**154,000**	2,500	NA	
7/22/2003	NA	**38,100**	**3,700**	NA	NA	NA	NA	NA	
7/23/2003	NA	NA	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - GRO	54,000	38,100	3,700	2,500	103,000	154,000	2,500	21,000	**47,350**
TPH - ORO									**TPH - ORO**
11/19/2002	NA	NA	NA	NA	2,500	NA	NA	2,500	
6/30/2003	**41,000**	NA	NA	**37,000**	NA	**20,000**	2,500	NA	
7/22/2003	NA	3,167	157,650	NA	NA	NA	NA	NA	
7/23/2003	NA	NA	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - ORO	41,000	3,167	157,650	37,000	2,500	20,000	2,500	2,500	**33,290**

Notes:
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 4C-5(c)
Soil Constituents Average Concentrations for Metals in Sub-area 3C: Retained Area, Construction Worker Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)
	LEAD
B42S3-9	11,600
B42S4-6	9,400
B42S5-8	8,800
B42S6-5	12,000
B42S7-8	10,900
Average Concentration - Only Samples With Metals Detections	10,540

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table [illegible](a)
Soil Constituents Average Concentrations for VOCs in Sub-area 3D: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)																
	1,2,4-TRIMETHYLBENZENE	1,3,5-TRIMETHYLBENZENE	ACETONE	BENZENE	CHLOROETHANE	ETHYLBENZENE	ISOPROPYL BENZENE	M,P-XYLENE	METHYLENE CHLORIDE	N-BUTYLBENZENE	N-PROPYLBENZENE	O-XYLENE	P-ISOPROPYLTOLUENE	SEC-BUTYLBENZENE	TERT-BUTYLBENZENE	TETRACHLOROETHENE	XYLENES, TOTAL
Non- Residential Worker																	
2-10024 0-2	**47,000**	ND	7.5	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	12	**12**
B2N4-6	0.5	0.5	NA	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	**1.4**	NA
B2W1-6	2.5	**36**	NA	**21**	**6.7**	2.5	**31**	**41**	2.5	**14**	**30**	**12**	**36**	**127**	**35**	2.5	NA
Average Concentration - Only Samples With VOC Detections	**15,668**	**18.25**		**10.75**	**3.60**		**15.75**	**20.75**		**7.25**	**15.25**	**6.25**	**18.25**	**63.75**	**17.75**	**5.30**	**12.00**
Construction Worker																	
2-10024 0-2	**47,000**	ND	7.5	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	12	**12**
B2I1-8	2.5	**66**	NA	2.5	2.5	**29**	**292**	**43**	2.5	**80**	2.5	2.5	**268**	2.5	**73**	2.5	NA
B2N3-8	0.5	0.5	NA	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	**1.9**	NA
B2N4-6	0.5	0.5	NA	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	**1.4**	NA
B2N6-6	2.5	2.5	10	1.75	2.5	1.75	2.5	2.5	2.8	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
B2N7-6	2.5	2.5	**13**	1.75	2.5	1.75	2.5	2.5	**3.2**	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
B2W1-6	2.5	**36**	NA	**21**	**6.7**	2.5	**31**	**41**	2.5	**14**	**30**	**12**	**36**	**127**	**35**	2.5	NA
Average Concentration - Only Samples With VOC Detections	**9401.2**	**25.75**		**6.13**	**2.55**	**8.13**	**81**	**21.25**		**23.75**	**8.38**	**3.88**	**76.25**	**32.625**	**27.25**	**4.06**	**12**

Notes:
ug/kg - micrograms per kilogram
* - Hand auger samples from below Building 220 floor slab
Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
VOCs - Volatile Organic Compounds
NA - Not Analyzed
No VOCs except acetone and/or methylene chloride detected in the sample

Table 4D-5(b)
Soil Constituents Average Concentrations for TPHs
in Sub-area 3D: Retained Area
Non-Residential Worker and Construction Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B2N7-6	B2W1-6	Overall Area Average (ug/kg)
TPH - DRO			**TPH - DRO**
11/7/2002	NA	NA	
11/8/2002	NA	**47,000**	
11/12/2002	NA	NA	
11/13/2002	NA	NA	
6/30/2003	NA	NA	
7/24/2003	**2,540**	NA	
AVERAGE TPH - DRO	2,540	47,000	**24,770**
TPH - GRO			**TPH - GRO**
6/30/2003	NA	NA	
7/24/2003	500	NA	
AVERAGE TPH - GRO	500		**500**
TPH - ORO			**TPH - ORO**
11/7/2002	NA	NA	
11/8/2002	NA	2,500	
11/12/2002	NA	NA	
11/13/2002	NA	NA	
6/30/2003	NA	NA	
7/24/2003	**8,720**	NA	
AVERAGE TPH - ORO	8,720	2,500	**5,610**

Notes:
Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 4D-5(c)
Soil Constituents Average Concentrations for Metals in Sub-area 3D: Retained Area, Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)																			
	ALUMINUM	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CALCIUM	CHROMIUM	COBALT	COPPER	IRON	LEAD	MANGANESE	MERCURY	NICKEL	POTASSIUM	SELENIUM	SILVER	SODIUM	THALLIUM	ZINC
2-10024 (0-2)	8,300,000	25,200	85,200	806	243.5	23,700,000	14,400	6,940	15,000	18,200,000	20,100	740,000	33.8	19,200	1,230,000	1,545	307.5	128,000	12,800	1,575
B2N6-6	NA	3,390	104,000	218	200	NA	5,900	NA	8,950	NA	6,460	305,000	50	6,440	NA	2,350	200	NA	2,550	24,800
B2N7-6	NA	8,810	109,000	385	1,080	NA	30,900	NA	16,000	NA	9,970	186,000	50	11,100	NA	5,200	469	NA	2,550	93,300
B2W1-6	NA	1,400	120,000	NA	125	NA	12,000	NA	NA	NA	6,800	NA	10	NA	NA	250	125	NA	NA	NA
Average Concentration - Only Samples With Metals Detections	8,300,000	9,700	104,550	470	412	23,700,000	15,800	6,940	13,317	18,200,000	10,833	410,333	36	12,247	1,230,000	2,336	275	128,000	5,967	39,892

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 4D-5(c)
Soil Constituents Average Concentrations for Metals in Sub-area 3D: Retained Area, Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)																			
	ALUMINUM	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CALCIUM	CHROMIUM	COBALT	COPPER	IRON	LEAD	MANGANESE	MERCURY	NICKEL	POTASSIUM	SELENIUM	SILVER	SODIUM	THALLIUM	ZINC
2-10024 (0-2)	8,300,000	25,200	85,200	806	243.5	23,700,000	14,400	6,940	15,000	18,200,000	20,100	740,000	33.8	19,200	1,230,000	1,545	307.5	128,000	12,800	1,575
B2I1-8	NA	8900	92,000	NA	125	NA	18,000	NA	NA	NA	10,000	NA	10	NA	NA	250	125	NA	NA	NA
B2N1-8	NA	250	63,000	NA	125	NA	6,900	NA	NA	NA	4,800	NA	10	NA	NA	250	125	NA	NA	NA
B2N2-8	NA	39,000	74,000	NA	125	NA	7,900	NA	NA	NA	5,900	NA	10	NA	NA	250	125	NA	NA	NA
B2N3-8	NA	3,400	83,000	NA	125	NA	13,000	NA	NA	NA	8,100	NA	30	NA	NA	250	125	NA	NA	NA
B2N6-6	NA	3,390	104,000	218	200	NA	5,900	NA	8,950	NA	6,460	305,000	50	6,440	NA	2350	200	NA	2550	24,800
B2N7-6	NA	8,810	109,000	385	1,080	NA	30,900	NA	16,000	NA	9,970	186,000	50	11,100	NA	5,200	469	NA	2550	93,300
B2W1-6	NA	1,400	120,000	NA	125	NA	12,000	NA	NA	NA	6,800	NA	10	NA	NA	250	125	NA	NA	NA
Average Concentration - Only Samples With Metals Detections	8,300,000	11,294	91,275	470	269	23,700,000	13,625	6,940	13,317	18,200,000	9,016	410,333	25	12,247	1,230,000	1,293	200	128,000	5,967	39,892

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 4D-5(d)
Soil Constituents Average Concentrations for PAHs in Sub-area 3D: Retained Area Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	PAH (ug/kg)
	BENZO(A)PYRENE
B41E1-10	85
Average Concentration - Only Samples With PAH Detections	85

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
PAH - Polynuclear aromatic hydrocarbon
NA - Not Analyzed

Table 4D-7(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 3D: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)														
	1,1-DICHLOROETHANE	1,1-DICHLOROETHENE	1,4-DIOXANE	ACETONE	BENZENE	CHLOROETHANE	CIS-1,2-DICHLOROETHENE	METHYL ETHYL KETONE (MEK)	METHYL ISOBUTYL KETONE	METHYLENE CHLORIDE	TETRACHLOROETHENE	TRANS-1,2-DICHLOROETHENE	TRICHLOROETHENE	TRICHLOROFLUOROMETHANE	VINYL CHLORIDE
B2I1W	2.5	2.5	NA	NA	2.5	2.5	2.5	NA	NA	2.5	2.5	2.5	2.5	2.5	**5.6**
B2I2W	2.5	2.5	2.5	10	2.5	2.5	2.5	2.5	5	7.2	2.5	2.5	2.5	2.5	2.5
B2N3W	1.5	1.5	NA	NA	1.5	1.5	**42**	NA	NA	1.5	**22**	**12**	**10.5**	1.5	1.5
B2N4W	0.5	0.5	NA	NA	0.5	0.5	**19**	NA	NA	0.5	**13**	**1.7**	**2.5**	0.5	0.5
B2N6W	2.5	2.5	2.5	10	**2.45**	2.5	2.5	2.5	5	**3**	2.5	2.5	2.5	2.5	2.5
B2N7W	2.5	2.5	2.5	**15**	1.75	2.5	2.5	**8.8**	**2.9**	**2.6**	2.5	2.5	2.5	2.5	2.5
B2W1W	2.5	2.5	NA	NA	**6.3**	**7.3**	2.5	NA	NA	2.5	2.5	2.5	2.5	**17**	2.5
B41E1W	0.5	0.5	NA	NA	0.5	0.5	**1.2**	NA	NA	0.5	0.5	0.5	**1.2**	0.5	0.5
B41MW-5	**104**	**8.3**	**36**	17.5	1.5	1.5	**4.45**	13.75	15	6.25	**3.75**	**1.5**	**2.45**	**1.5**	**7.9**
Average Concentration - Only Samples With VOC Detections	**14.56**	**2.60**	**13.67**	**14.17**	**2.13**	**2.35**	**9.58**	**8.35**	**7.63**	**2.42**	**6.16**	**3.21**	**3.33**	**3.56**	**2.94**

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed
No VOCs except methylene chloride detected in the sample

Table 4E-5(a)
Soil Constituents Average Concentrations for VOCs in Sub-area 3E: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)											
	ACETONE	BENZENE	ETHYLBENZENE	ISOPROPYL BENZENE	METHYL TERT-BUTYL ETHER	METHYLENE CHLORIDE	NAPHTHALENE	N-BUTYLBENZENE	N-PROPYLBENZENE	SEC-BUTYLBENZENE	TOLUENE	XYLENES, TOTAL
Non- Residential Worker												
B2E1-7	NA	1,340	307	NA	250	NA	NA	NA	NA	NA	719	586
B2E2-8	56.5	67.5	63.375	28	18.75	33	20	71.5	115	31.5	34	137.5
Average Concentration - Only Samples With VOC Detections	56.5	703.75	185.19	28	134.38	33	20	71.5	115	31.5	376.5	361.75
Construction Worker												
B2E1-7	NA	1,340	307	NA	250	NA	NA	NA	NA	NA	719	586
B2E2-8	56.5	67.5	63.375	28	18.75	33	20	71.5	115	31.5	34	137.5
Average Concentration - Only Samples With VOC Detections	56.5	703.75	185.19	28	134.38	33	20	71.5	115	31.5	376.5	361.75

Notes:
ug/kg - micrograms per kilogram
* - Hand auger samples from below Building 220 floor slab
Groundwater table is at a depth of 9 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
VOCs - Volatile Organic Compounds
NA - Not Analyzed

Table 4E-5(b)
Soil Constituents Average Concentrations for TPHs
in Sub-area 3E: Retained Area
Non-Residential Worker and Construction Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B2E1-7	B2E2-8	Overall Area Average (ug/kg)
TPH - DRO			**TPH - DRO**
7/1/2003	2,500	NA	
7/24/2003	NA	2,125	
AVERAGE TPH - DRO	2,500	2,125	**2,312**
TPH - GRO			**TPH - GRO**
7/1/2003	**496,000**	NA	
7/24/2003	NA	**53,100**	
AVERAGE TPH - GRO	496,000	53,100	**274,550**
TPH - ORO			**TPH - ORO**
7/1/2003	2,500	NA	
7/24/2003	NA	3,187	
AVERAGE TPH - ORO	2,500	3,187	**2,844**

Notes:
Groundwater table is at a depth of 9 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 4E-5(c)
Soil Constituents Average Concentrations
for Metals in Sub-area 3E:
Retained Area
Non-Residential Worker and
Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)
	LEAD
B2E2-8	8,100
Average Concentration - Only Samples With Metals Detections	8,100

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 9 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 4F-5(a)
Soil Constituents Average Concentrations for Metals in Sub-area 3F: Retained Area, Construction Worker Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)
	LEAD
B1W2-8	7485
Average Concentration - Only Samples With Metals Detections	7,485

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 4G-5(a)
Soil Constituents Average Concentrations for VOCs in Sub-area 3G: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)											
	1,2,4-TRIMETHYLBENZENE	1,3,5-TRIMETHYLBENZENE	ACETONE	BENZENE	ETHYLBENZENE	M,P-XYLENE	METHYL TERT-BUTYL ETHER	NAPHTHALENE	O-XYLENE	P-ISOPROPYLTOLUENE	TOLUENE	XYLENES, TOTAL
Non- Residential Worker												
B2S2-7	840	326.3	820	547.8	1,010	2,650	378	477.5	1,490	416.3	5,700	3,550
Average Concentration - Only Samples With VOC Detections	840	326.25	820	547.75	1,010	2,650	378	477.5	1,490	416.25	5,700	3,550
Construction Worker												
B2S2-7	840	326.3	820	547.8	1,010	2,650	378	477.5	1,490	416.3	5,700	3,550
Average Concentration - Only Samples With VOC Detections	840	326.25	820	547.75	1,010	2,650	378	477.5	1,490	416	5,700	3,550

Notes:
ug/kg - micrograms per kilogram
* - Hand auger samples from below Building 220 floor slab
Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
VOCs - Volatile Organic Compounds
NA - Not Analyzed

Table 4G-5(b)
Soil Constituents Average Concentrations for TPHs
in Sub-area 3G: Retained Area
Non-Residential Worker and Construction Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B2S2-7	Overall Area Average (ug/kg)
TPH - DRO		TPH - DRO
7/1/2003	NA	
7/24/2003	**85,750**	
AVERAGE TPH - DRO	85,750	**85,750**
TPH - GRO		TPH - GRO
7/1/2003	NA	
7/24/2003	**3,280**	
AVERAGE TPH - GRO	3,280	**3,280**
TPH - ORO		TPH - ORO
7/1/2003	NA	
7/24/2003	**1,470,000**	
AVERAGE TPH - ORO	1,470,000	**1,470,000**

Notes:
Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 4G-5(c)
Soil Constituents Average Concentrations for Metals in Sub-area 3G: Retained Area Non-Residential Worker and Construction Worker Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)
	LEAD
B2S2-7	11,655
Average Concentration - Only Samples With Metals Detections	11,655

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 7 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 4H-5(a)
Soil Constituents Average Concentrations for VOCs
in Sub-area 3H: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)			
	ACETONE	METHYL ETHYL KETONE (MEK	METHYLENE CHLORIDE	XYLENES, TOTAL
Non- Residential Worker				
Average Concentration - Only Samples With VOC Detections				
Construction Worker				
B4E1-14	NA	NA	NA	9.4
B4E3-18	21	8.8	4.5	2.5
Average Concentration - Only Samples With VOC Detections	**21**	**8.8**	**4.5**	**5.95**

Notes:
ug/kg - micrograms per kilogram
* - Hand auger samples from below Building 220 floor slab
Groundwater table is at a depth of 9 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
VOCs - Volatile Organic Compounds
NA - Not Analyzed

Table 4H-5(b)
Soil Constituents Average Concentrations for TPHs in Sub-area 3H:
Retained Area, Construction Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B4E1-14	B4E2D-10	B4E3-18	Overall Area Average (ug/kg)
TPH - DRO				**TPH - DRO**
11/21/2002	**47,000**	NA	NA	
11/22/2002	NA	**55,000**	NA	
7/24/2003	NA	NA	**6,360**	
AVERAGE TPH - DRO	47,000	55,000	6,360	**36,120**
TPH - GRO				**TPH - GRO**
11/22/2002	NA	250	NA	
7/24/2003	NA	NA	500	
AVERAGE TPH - GRO		250	500	**375**
TPH - ORO				**TPH - ORO**
7/24/2003	NA	NA	3,159	
AVERAGE TPH - ORO			3,159	**3,159**

Notes:
Groundwater table is at a depth of 9 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 4H-5(c)
Soil Constituents Average Concentrations for Metals in Sub-area 3H: Retained Area, Construction Worker Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)
	LEAD
B4E3-18	8,630
Average Concentration - Only Samples With Metals Detections	8,630

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 9 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 4-6
Groundwater Samples Used in Average Concentration Calculations in Area 3: Retained Area
Boeing Tract 1, St. Louis, Missouri

	Volatile Organic Compounds	Total Petroleum Hydrocarbons	Polynuclear Aromatic Hydrocarbons	Polychlorinated Biphenyls	Metals
3A	B41N1W	B42N2W			B42N2W
	B42N5W	B42N3W			B42N3W
	B42N5W	B42N4W			B42N4W
		B42N5W			B42N5W
					B44N1W
3B	B42E1W	B42E1W			B42E2W
	B42E3W	B42E2W			B42E3W
		B42E3W			
3C	B42S3W	B42S2W			
	B42S4W	B42S3W			
	B42S5W	B42S4W			
	B42S6W	B42S5W			
	B42S7W	B42S6W			
	B42W1W	B42S7W			
	B45S10W	B42W1W			
	MW-A4W	B45S10W			
		B45S11W			
		B45S8W			
		B45S9W			
3D	B2I1W	B2N6W			B2I1W
	B2N3W	B2N7W			B2N1W
	B2N4W	B41MW-5			B2N2W
	B2N6W				B2N3W
	B2N7W				B2N6W
	B2W1W				B2N7W
	B41E1W				B2W1W
	B41MW-5				
3E	B2E1W	B2E2W			B2E2W
	B2E2W				
3F		B1W2W			
3G	B2S1W	B2S2W			
	B2S2W				
3H	B4E3W	B4E1W	B5MW-22W		B4E3W
	B5MW-22W	B4E3W			B5MW-22W
		B5MW-22W			

Note:
- analysis type not performed

Table 4A-7(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 3A: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)													
	1,2,4-TRIMETHYLBENZENE	BENZENE	CIS-1,2-DICHLOROETHENE	ETHYLBENZENE	ISOPROPYL BENZENE	M,P-XYLENE	METHYL TERT-BUTYL ETHER	N-PROPYLBENZENE	P-ISOPROPYLTOLUENE	SEC-BUTYLBENZENE	TOLUENE	TRANS-1,2-DICHLOROETHENE	VINYL CHLORIDE	XYLENES, TOTAL
B41N1W	13	135	2.5	2.5	24	31	NA	117	68	41	2.5	2.5	2.5	NA
B42N5W	2.5	3.11	760	11.25	22	2.5	14.5	25	2.5	20	4.4	31	12	14
Average Concentration - Only Samples With VOC Detections	**7.75**	**69.06**	**381.25**	**6.88**	**23.00**	**16.75**	**14.50**	**71.00**	**35.25**	**30.50**	**3.45**	**16.75**	**7.25**	**14.00**

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed

Table 4A-7(b)
Groundwater Constituents Average Concentrations for TPHs in Sub-area 3A: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B42N2W	B42N3W	B42N4W	B42N5W	B42N5W - 2004	Overall Area Average (ug/l)
TPH-DRO						**TPH-DRO**
11/7/2002	NA	NA	NA	NA	NA	
11/8/2002	NA	NA	NA	NA	NA	
11/14/2002	NA	NA	NA	NA	NA	
7/1/2003	NA	NA	NA	NA	NA	
7/23/2003	**329**	**204**	**134**	**34,000**	NA	
4/29/2004	NA	NA	NA	NA	**250**	
AVERAGE	329	204	134	34,000	250	**6,983**
TPH-GRO						**TPH-GRO**
7/1/2003	NA	NA	NA	NA	NA	
7/23/2003	500	500	500	**1,800**	NA	
4/29/2004	NA	NA	NA	NA	**2,000**	
AVERAGE	500	500	500	1,800	2,000	**1,060**
TPH-ORO						**TPH-ORO**
11/7/2002	NA	NA	NA	NA	NA	
11/8/2002	NA	NA	NA	NA	NA	
11/14/2002	NA	NA	NA	NA	NA	
7/1/2003	NA	NA	NA	NA	NA	
7/23/2003	75	150	75	**6,695**	NA	
4/29/2004	NA	NA	NA	NA	**250**	
AVERAGE	75	150	75	6,695	250	**1,449**

Notes:
ug/l - micrograms per liter
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 4A-7(c)
Groundwater Constituents Average Concentrations for Metals in Sub-area 3A: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/l)			
	ARSENIC	BARIUM	CHROMIUM	LEAD
B42N2W	NA	NA	NA	22
B42N3W	NA	NA	NA	22
B42N4W	NA	NA	NA	22
B42N5W	NA	NA	NA	22
B44N1W	**100**	**960**	**64**	**110**
Average Concentration - Only Samples With Metals Detections	**100**	**960**	**64**	**40**

Notes:
ug/l - micrograms per liter
NA - Not Analyzed
Bold indicates a detection

Table 4B-7(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 3B: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)						
	ACETONE	ISOPROPYL BENZENE	METHYLENE CHLORIDE	NAPHTHALENE	N-PROPYLBENZENE	SEC-BUTYLBENZENE	XYLENES, TOTAL
B42E1W	NA	NA	NA	NA	NA	NA	52.1
B42E2W	10	2.5	3	5	2.5	2.5	2.5
B42E3W	13	5.65	6.75	8.7	6.1	2.55	2.5
Average Concentration - Only Samples With VOC Detections	**13**	**5.65**	**6.75**	**8.7**	**6.1**	**2.55**	**27.3**

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed
No VOCs except methylene chloride detected in the sample

Table 4B-7(b)
Groundwater Constituents Average Concentrations for TPHs in Sub-area 3B: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B42E1W	B42E1W - 2004	B42E2W	B42E3W	Overall Area Average (ug/l)
TPH-DRO					**TPH-DRO**
7/1/2003	**1,240**	NA	NA	NA	
7/23/2003	NA	NA	**197**	NA	
7/24/2003	NA	NA	NA	**427**	
4/30/2004	NA	250	NA	NA	
AVERAGE	1,240	250	197	427	**529**
TPH-GRO					**TPH-GRO**
7/1/2003	**11,310**	NA	NA	NA	
7/23/2003	NA	NA	500	NA	
7/24/2003	NA	NA	NA	500	
4/30/2004	NA	**1,000**	NA	NA	
AVERAGE	11,310	1,000	500	500	**3,328**
TPH-ORO					**TPH-ORO**
7/1/2003	500	NA	NA	NA	
7/23/2003	NA	NA	**259**	NA	
7/24/2003	NA	NA	NA	75	
4/30/2004	NA	250	NA	NA	
AVERAGE	500	250	259	75	**271**

Notes:
ug/l - micrograms per liter
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 4B-7(c)
Groundwater Constituents Average Concentrations for Metals in Sub-area 3B: Retained Area Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/l)
	LEAD
B42E2W	22
B42E3W	46
Average Concentration - Only Samples With Metals Detections	34

Notes:
ug/l - micrograms per liter
NA - Not Analyzed
Bold indicates a detection

Table 4C-7(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 3C: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)																
	1,1,1-TRICHLOROETHANE	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHAN	1,1-DICHLOROETHANE	1,1-DICHLOROETHENE	BENZENE	CARBON TETRACHLORIDE	CHLOROFORM	CIS-1,2-DICHLOROETHENE	ETHYLBENZENE	ISOPROPYL BENZENE	METHYL TERT-BUTYL ETHER	METHYLENE CHLORIDE	N-BUTYLBENZENE	N-PROPYLBENZENE	SEC-BUTYLBENZENE	TOLUENE	XYLENES, TOTAL
B42S3W	2.5	2.5	2.5	2.5	1.75	4.7	93	2.5	1.75	2.5	3	10	2.5	2.5	2.5	1.75	2.5
B42S4W	2.3	2.5	3.95	2.5	1.75	2.5	2.5	8.6	1.75	2.5	3	10	2.5	2.5	2.5	1.75	2.5
B42S5W	62.5	62.5	62.5	62.5	891.25	62.5	62.5	62.5	56.25	1100	197.5	250	1200	1300	1000	431.25	3100
B42S6W	13.75	13.75	13.75	13.65	7.375	13.75	13.75	13.75	7.95	15.25	15.3	55	35.75	25.75	23.75	8.675	5
B42S7W	2.5	5.9	2.5	2.5	1.75	2.5	2.5	2.5	7.25	2.5	3	10	2.5	2.5	2.5	1.75	23
B42W1W	NA	NA	NA	NA	50	NA	NA	NA	50	NA	50	NA	NA	NA	NA	395	299
B45S10W	NA	NA	NA	NA	2.5	NA	NA	NA	2.5	NA	2.5	NA	NA	NA	NA	11.6	2.5
MW-A4W	2.5	2.5	2.9	2.5	2.5	2.5	2.5	2.5	2.5	2.5	5	5.5	2.5	2.5	2.5	2.5	NA
Average Concentration - Only Samples With VOC Detections	**14.34**	**14.94**	**14.68**	**14.36**	**119.86**	**14.74**	**29.46**	**15.39**	**16.24**	**187.5**	**34.91**	**56.75**	**207.63**	**222.63**	**172.29**	**106.78**	**490.6**

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed

Table 4C-7(b)
Groundwater Constituents Average Concentrations for TPHs in Sub-area 3C: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B42S2W	B42S3W	B42S4W	B42S5W	B42S5W - 2004	B42S6W	B42S7W	B42W1W	B42W1W - 2004	B45S10W	B45S11W	B45S8W	B45S8W - 2004	B45S9W	Overall Area Average (ug/l)
TPH-DRO															**TPH-DRO**
11/19/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	500	NA	500	NA	500	
11/20/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
6/30/2003	**12,600**	NA	NA	NA	NA	NA	NA	**91,090**	NA	NA	**98,170**	NA	NA	NA	
7/22/2003	NA	NA	NA	**2,920,000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/23/2003	NA	**154**	**175**	NA	NA	**657**	**1,230**	NA	NA	NA	NA	NA	NA	NA	
4/30/2004	NA	NA	NA	NA	NA	NA	NA	NA	250	NA	NA	NA	NA	NA	
5/4/2004	NA	NA	NA	NA	250	NA	NA	NA	NA	NA	NA	NA	250	NA	
AVERAGE	12,600	154	175	2,920,000	250	657	1,230	91,090	250	500	98,170	500		500	**240,467**
TPH-GRO															**TPH-GRO**
11/19/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	**17,440**	NA	**268,300**	NA	**10,820**	
11/20/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
6/30/2003	**1,010**	NA	NA	NA	NA	NA	NA	**64,560**	NA	NA	**10,570**	NA	NA	NA	
7/22/2003	NA	NA	NA	**364,000**	NA	**3,450**	NA	NA	NA	NA	NA	NA	NA	NA	
7/23/2003	NA	500	500	NA	NA	500	500	NA	NA	NA	NA	NA	NA	NA	
4/30/2004	NA	NA	NA	NA	NA	NA	NA	NA	**600**	NA	NA	NA	NA	NA	
5/4/2004	NA	NA	NA	NA	**900**	NA	NA	NA	NA	NA	NA	NA	250	NA	
AVERAGE	1,010	500	500	364,000	900	1,975	500	64,560	600	17,440	10,570	268,300		10,820	**57,052**
TPH-ORO															**TPH-ORO**
11/19/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	500	NA	500	NA	500	
6/30/2003	**2,950**	NA	NA	NA	NA	NA	NA	**2,570**	NA	NA	500	NA	NA	NA	
7/22/2003	NA	NA	NA	375,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/23/2003	NA	75	75	NA	NA	**353**	**872**	NA	NA	NA	NA	NA	NA	NA	
4/30/2004	NA	NA	NA	NA	NA	NA	NA	NA	250	NA	NA	NA	NA	NA	
5/4/2004	NA	NA	NA	NA	250	NA	NA	NA	NA	NA	NA	NA	250	NA	
AVERAGE	2,950	75	75	375,000	250	353	872	2,570	250	500	500	500		500	**29,569**

Notes:
ug/l - micrograms per liter
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 4D-7(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 3D: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)														
	1,1-DICHLOROETHANE	1,1-DICHLOROETHENE	1,4-DIOXANE	ACETONE	BENZENE	CHLOROETHANE	CIS-1,2-DICHLOROETHENE	METHYL ETHYL KETONE (MEK)	METHYL ISOBUTYL KETONE	METHYLENE CHLORIDE	TETRACHLOROETHENE	TRANS-1,2-DICHLOROETHENE	TRICHLOROETHENE	TRICHLOROFLUOROMETHANE	VINYL CHLORIDE
B2I1W	2.5	2.5	NA	NA	2.5	2.5	2.5	NA	NA	2.5	2.5	2.5	2.5	2.5	5.6
B2I2W	2.5	2.5	2.5	10	2.5	2.5	2.5	2.5	5	7.2	2.5	2.5	2.5	2.5	2.5
B2N3W	1.5	1.5	NA	NA	1.5	1.5	42	NA	NA	1.5	22	12	10.5	1.5	1.5
B2N4W	0.5	0.5	NA	NA	0.5	0.5	19	NA	NA	0.5	13	1.7	2.5	0.5	0.5
B2N6W	2.5	2.5	2.5	10	2.45	2.5	2.5	2.5	5	3	2.5	2.5	2.5	2.5	2.5
B2N7W	2.5	2.5	2.5	15	1.75	2.5	2.5	8.8	2.9	2.6	2.5	2.5	2.5	2.5	2.5
B2W1W	2.5	2.5	NA	NA	6.3	7.3	2.5	NA	NA	2.5	2.5	2.5	2.5	17	2.5
B41E1W	0.5	0.5	NA	NA	0.5	0.5	1.2	NA	NA	0.5	0.5	0.5	1.2	0.5	0.5
B41MW-5	104	8.3	36	17.5	1.5	1.5	4.45	13.75	15	6.25	3.75	1.5	2.45	1.5	7.9
Average Concentration - Only Samples With VOC Detections	**14.56**	**2.60**	**13.67**	**14.17**	**2.13**	**2.35**	**9.58**	**8.35**	**7.63**	**2.42**	**6.16**	**3.21**	**3.33**	**3.56**	**2.94**

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed
No VOCs except methylene chloride detected in the sample

Table 4D-7(b)
Groundwater Constituents Average Concentrations for TPHs in
Sub-area 3D: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B2N6W	B2N7W	B41MW-5	Overall Area Average (ug/l)
TPH-DRO				**TPH-DRO**
11/1/2002	NA	NA	**180**	
11/7/2002	NA	NA	NA	
11/12/2002	NA	NA	NA	
11/13/2002	NA	NA	NA	
6/30/2003	NA	NA	NA	
7/24/2003	**181**	**208**	NA	
AVERAGE	181	208	180	190
TPH-GRO				**TPH-GRO**
6/30/2003	NA	NA	NA	
7/24/2003	500	500	NA	
AVERAGE	500	500		500
TPH-ORO				**TPH-ORO**
11/7/2002	NA	NA	NA	
11/12/2002	NA	NA	NA	
11/13/2002	NA	NA	NA	
6/30/2003	NA	NA	NA	
7/24/2003	75	75	NA	
AVERAGE	75	75		75

Notes:
ug/l - micrograms per liter
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 4D-7(c)
Groundwater Constituents Average Concentrations for Metals in Sub-area 3D: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/l)								
	ARSENIC	BARIUM	CADMIUM	CHROMIUM	COPPER	LEAD	MANGANESE	MERCURY	ZINC
B2I1W	5	**500**	2.5	**32**	NA	**13**	NA	0.1	NA
B2N1W	5	**1300**	2.5	**40**	NA	**79**	NA	**0.33**	NA
B2N2W	**34**	**600**	2.5	**42**	NA	**39**	NA	0.1	NA
B2N3W	**98**	**10000**	2.5	**320**	NA	**110**	NA	0.1	NA
B2N6W	15	**727**	2	2.5	**4**	**22**	**3870**	0.1	5
B2N7W	15	**219**	**43**	**25**	**6**	**22**	**441**	0.1	**28**
B2W1W	5	**500**	2.5	**10**	NA	2.5	NA	0.1	NA
Average Concentration - Only Samples With Metals Detections	**25.286**	**1,978**	**8.21**	**67.357**	**5**	**41.071**	**2,156**	**0.13**	**16.5**

Notes:
ug/l - micrograms per liter
NA - Not Analyzed
Bold indicates a detection

Table 4E-7(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 3E:
Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)								
	1,2,4-TRIMETHYLBENZENE	1,3,5-TRIMETHYLBENZENE	ACETONE	ETHYLBENZENE	M,P-XYLENE	NAPHTHALENE	N-PROPYLBENZENE	TOLUENE	XYLENES, TOTAL
B2E1W	NA	NA	NA	12.8	NA	NA	NA	5.2	5.5
B2E2W	2,500	620	540	2,476.67	5,300	930	380	250	4,570
Average Concentration - Only Samples With VOC Detections	**2,500**	**620**	**540**	**1,244.7**	**5,300**	**930**	**380**	**127.6**	**2,288**

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed

Table 4E-7(b)
Groundwater Constituents Average Concentrations
for TPHs in Sub-area 3E: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B2E2W	B2E2W - 2004	Overall Area Average (ug/l)
TPH-DRO			**TPH-DRO**
7/1/2003	NA	NA	
7/24/2003	**99,800**	NA	
4/29/2004	NA	250	
AVERAGE	99,800	250	50,025
TPH-GRO			**TPH-GRO**
7/1/2003	NA	NA	
7/24/2003	50,000	NA	
4/29/2004	NA	**9,000**	
AVERAGE	50,000	9,000	29,500
TPH-ORO			**TPH-ORO**
7/1/2003	NA	NA	
7/24/2003	7,500	NA	
4/29/2004	NA	**2,200**	
AVERAGE	7,500	2,200	4,850

Notes:
ug/l - micrograms per liter
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 4E-7(c)
Groundwater Constituents Average Concentrations for Metals in Sub-area 3E: Retained Area Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/l)
	LEAD
B2E2W	71
Average Concentration - Only Samples With Metals Detections	**71**

Notes:
ug/l - micrograms per liter
NA - Not Analyzed
Bold indicates a detection

Table 4F-7(a)
Groundwater Constituents Average Concentrations for TPHs in Sub-area 3F: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B1W2W	Overall Area Average (ug/l)
TPH-DRO		TPH-DRO
7/1/2003	NA	
7/25/2003	**514**	
AVERAGE	514	514
TPH-GRO		TPH-GRO
7/1/2003	NA	
7/25/2003	500	
AVERAGE	500	500
TPH-ORO		TPH-ORO
7/1/2003	NA	
7/25/2003	**1,543**	
AVERAGE	1,543	1,543

Notes:
ug/l - micrograms per liter
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 4G-7(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 3G: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)															
	1,2,4-TRIMETHYLBENZENE	1,3,5-TRIMETHYLBENZENE	ACETONE	BENZENE	ETHYLBENZENE	ISOPROPYL BENZENE	M,P-XYLENE	METHYL ETHYL KETONE (MEK)	METHYL TERT-BUTYL ETHER	METHYLENE CHLORIDE	NAPHTHALENE	N-PROPYLBENZENE	O-XYLENE	P-ISOPROPYLTOLUENE	TOLUENE	XYLENES, TOTAL
B2S1W	NA	NA	NA	2.5	2.5	NA	NA	NA	14.6	NA	NA	NA	NA	NA	2.5	2.5
B2S2W	5.5	3.1	34	965	125.5	2.1	36	10	58.6	2.3	18	3.7	22	3.3	496	349
Average Concentration - Only Samples With VOC Detections	**5.5**	**3.1**	**34**	**483.75**	**64**	**2.1**	**36**	**10**	**36.6**	**2.3**	**18**	**3.7**	**22**	**3.3**	**249.25**	**175.75**

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed

Table 4G-7(b)
Groundwater Constituents Average Concentrations
for TPHs in Sub-area 3G: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B2S2W	B2S2W - 2004	Overall Area Average (ug/l)
TPH-DRO			**TPH-DRO**
7/1/2003	NA	NA	
7/24/2003	**3,360**	NA	
4/30/2004	NA	**640**	
AVERAGE	3,360	640	**2,000**
TPH-GRO			**TPH-GRO**
7/1/2003	NA	NA	
7/24/2003	**6,680**	NA	
4/30/2004	NA	3,400	
AVERAGE	6,680	3,400	**5,040**
TPH-ORO			**TPH-ORO**
7/1/2003	NA	NA	
7/24/2003	**3,780**	NA	
4/30/2004	NA	2,300	
AVERAGE	3,780	2,300	**3,040**

Notes:
ug/l - micrograms per liter
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 4H-7(a)
Groundwater Constituents Average Concentrations for VOCs
in Sub-area 3H: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)			
	1,2-DICHLOROBENZENE	CARBON DISULFIDE	METHYLENE CHLORIDE	TOLUENE
B4E3W	2.5	2.1	10	2.35
B5MW-22W	3.2	5	3.9	2.5
Average Concentration - Only Samples With VOC Detections	**2.85**	**3.55**	**6.95**	**2.43**

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed

Table 4H-7(b)
Groundwater Constituents Average Concentrations for TPHs in
Sub-area 3H: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B4E1W	B4E3W	B5MW-22W	Overall Area Average (ug/l)
TPH-DRO				**TPH-DRO**
11/21/2002	**3,500**	NA	NA	
11/22/2002	NA	NA	NA	
6/27/2003	NA	NA	**520**	
7/24/2003	NA	**3,540**	NA	
AVERAGE	3,500	3,540	520	**2,520**
TPH-GRO				**TPH-GRO**
11/22/2002	NA	NA	NA	
6/27/2003	NA	NA	50	
7/24/2003	NA	500	NA	
AVERAGE		500	50	**275**
TPH-ORO				**TPH-ORO**
6/27/2003	NA	NA	50	
7/24/2003	NA	375	NA	
AVERAGE		375	50	**213**

Notes:
ug/l - micrograms per liter
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 4H-7(c)
Groundwater Constituents Average Concentrations for Metals in Sub-area 3H: Retained Area
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/l)								
	ARSENIC	BARIUM	CHROMIUM	COPPER	LEAD	MANGANESE	MERCURY	NICKEL	ZINC
B4E3W	NA	NA	NA	NA	22	NA	NA	NA	NA
B5MW-22W	80	1910	14	17	68	8860	0.5	23	378
Average Concentration - Only Samples With Metals Detections	**80**	**1,910**	**14**	**17**	**45**	**8,860**	**0.50**	**23**	**378**

Notes:
ug/l - micrograms per liter
NA - Not Analyzed
Bold indicates a detection

Table 4H-7(d)
Groundwater Constituents Average Concentrations for PAHs in Sub-area 3H: Retained Area Boeing Tract 1, St. Louis, Missouri

Sample ID	PAHs (ug/l)
	ACENAPHTHENE
B5MW-22W	**7.8**
Average Concentration - Only Samples With PAH Detections	**7.8**

Notes:
ug/l - micrograms per liter
PAH - Polynuclear aromatic hydrocarbon
NA - Not Analyzed
Bold indicates a detection

Table 4A-8(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Sub-area 3A: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
1,2,4-Trimethylbenzene	2	1	1.91	51	27	NA	N/A
1,3,5-Trimethylbenzene	2	1	1.97	192	97	NA	N/A
Benzene	2	1	1.82	18	10	NA	N/A
Ethylbenzene	2	2	1.53	10	6.5	NA	N/A
Isopropylbenzene	2	1	1.84	29	16	NA	N/A
m,p-Xylene	2	1	1.83	27	15	NA	N/A
Methylene chloride	2	1	1.37	5.4	4.0	NA	N/A
p-Isopropyltoluene	2	1	1.96	116	59	NA	N/A
Toluene	2	2	1.79	26	15	NA	N/A
Xylenes, Total	1	1	1.00	6.7	6.7	NA	N/A
Polynuclear Aromatic Hydrocabons (PAHs)							
None	1	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	2	1	1.00	24,000	24,000	NA	N/A
TPH GRO	1	0	N/A	ND	N/A	NA	N/A
TPH ORO	2	0	N/A	ND	2,500	NA	N/A
Total Metals							
Lead	1	1	1.00	8,690	8,690	21,800	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4A-8(b)
Soil Constituents of Concern Summary for Construction Worker for Sub-area 3A: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
1,2,4-Trimethylbenzene	9	1	4.70	51	11	NA	N/A
1,3,5-Trimethylbenzene	9	1	6.19	192	31	NA	N/A
Benzene	10	3	5.03	186	37	NA	N/A
Ethylbenzene	10	3	8.69	91	10	NA	N/A
Isopropylbenzene	9	3	4.31	80	19	NA	N/A
m.p-Xylene	9	3	2.39	27	11	NA	N/A
Methylene chloride	9	4	3.84	29	7.5	NA	N/A
n-Propylbenzene	9	2	5.68	110	19	NA	N/A
p-Isopropyltoluene	9	2	5.58	116	21	NA	N/A
sec-Butylbenzene	9	3	3.48	91	26	NA	N/A
Toluene	10	5	3.18	26	8.2	NA	N/A
Xylenes, Total	5	3	3.26	64	20	NA	N/A
Polynuclear Aromatic Hydrocabons (PAHs)							
None	3	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	9	2	2.00	24,000	12,003	NA	N/A
TPH GRO	5	2	1.03	7,000	6,770	NA	N/A
TPH ORO	9	0	N/A	ND	2,714	NA	N/A
Total Metals							
Arsenic	1	1	1.00	2,000	2,000	9,200	N
Barium	1	1	1.00	110,000	110,000	725,000	N
Chromium	1	1	1.00	13,000	13,000	58,000	N
Lead	5	5	1.23	11,200	9,094	21,800	N
Mercury	1	1	1	94	94	39	Y

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4B-8(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Sub-area 3B: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Acetone	1	1	1.00	19	19	NA	N/A
Benzene	1	1	1.95	107	55	NA	N/A
Carbon Disulfide	1	1	1.00	3.0	3.0	NA	N/A
Ethylbenzene	1	1	1.82	26	14	NA	N/A
Isopropylbenzene	1	1	1.00	4.0	4.0	NA	N/A
n-Propylbenzene	1	1	1.00	2.9	2.9	NA	N/A
sec-Butylbenzene	1	1	1.00	5.7	5.7	NA	N/A
Toluene	1	1	1.55	8.6	5.6	NA	N/A
Xylenes, Total	1	1	1.00	58	58	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	1	0	N/A	ND	2,081	NA	N/A
TPH GRO	1	1	1.00	29,200	29,200	NA	N/A
TPH ORO	1	0	N/A	ND	3,121	NA	N/A
Total Metals							
Lead	1	1	1.00	14,600	14,600	21,800	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4B-8(b)
Soil Constituents of Concern Summary for Construction Worker for Sub-area 3B: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Acetone	2	1	1.31	19	15	NA	N/A
Benzene	3	3	2.82	1,170	414	NA	N/A
Carbon Disulfide	2	1	0.75	3.0	4.0	NA	N/A
Ethylbenzene	3	2	3.46	110	32	NA	N/A
Isopropylbenzene	2	1	1.23	4.0	3.3	NA	N/A
n-Propylbenzene	2	1	1.07	2.9	2.7	NA	N/A
sec-Butylbenzene	2	2	1.26	10	7.7	NA	N/A
Toluene	3	3	2.85	398	140	NA	N/A
Xylenes, Total	3	3	2.59	731	282	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	3	1	2.60	29,960	11,514	NA	N/A
TPH GRO	3	3	2.65	311,000	117,333	NA	N/A
TPH ORO	3	0	N/A	ND	2,930	NA	N/A
Total Metals							
Lead	2	2	1.18	14,600	12,400	21,800	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4C-8(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Sub-area 3C: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	4	0	N/A	ND	N/A	NA	N/A
TPH GRO	4	0	N/A	ND	N/A	NA	N/A
TPH ORO	4	0	N/A	ND	N/A	NA	N/A

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4C-8(b)
Soil Constituents of Concern Summary for Construction Worker for Sub-area 3C: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Acetone	5	2	1.38	44	32	NA	N/A
Benzene	13	4	3.72	293	79	NA	N/A
Isopropylbenzene	5	1	2.71	47	17	NA	N/A
Methyl ter-butyl ether	13	2	2.10	30	14	NA	N/A
Methylene chloride	5	1	0.25	5.4	22	NA	N/A
n-Butylbenzene	5	2	2.63	59	22	NA	N/A
n-Propylbenzene	5	1	2.83	84	30	NA	N/A
sec-Butylbenzene	5	2	2.61	62	24	NA	N/A
tert-Butylbenzene	5	1	2.12	12	5.7	NA	N/A
Toluene	13	6	3.81	2,500	656	NA	N/A
Xylenes, Total	13	5	1.98	513	259	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	13	6	3.12	972,000	311,290	NA	N/A
TPH GRO	13	6	3.25	154,000	47,350	NA	N/A
TPH ORO	12	3	1.23	41,000	33,290	NA	N/A
Total Metals							
Lead	5	5	1.14	12,000	10,540	21,800	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Tab[illegible]8(a)
Soil Constituents of Concern Summary for Non-[illegible]ential Worker for Sub-area 3D: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
1,2,4-Trimethylbenzene	8	1	3.00	47,000	15,668	NA	N/A
1,3,5-Trimethylbenzene	7	1	1.97	36	18	NA	N/A
Benzene	7	1	1.95	21	11	NA	N/A
Chloroethane	7	1	1.86	6.7	3.6	NA	N/A
Isopropylbenzene	7	1	1.97	31	16	NA	N/A
m,p-Xylene	7	1	1.98	41	21	NA	N/A
n-Butylbenzene	7	1	1.93	14	7.3	NA	N/A
n-Propylbenzene	7	1	1.97	30	15	NA	N/A
o-Xylene	7	1	1.92	12	6.3	NA	N/A
p-Isopropyltoluene	7	1	1.97	36	18	NA	N/A
sec-Butylbenzene	7	1	1.99	127	64	NA	N/A
tert-Butylbenzene	7	1	1.97	35	18	NA	N/A
Tetrachloroethene	8	1	0.26	1.4	5.3	NA	N/A
Xylenes, Total	4	1	1.00	12	12	NA	N/A
Polynuclear Aromatic Hydrocabons (PAHs)							
None	2	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	6	2	1.90	47,000	24,770	NA	N/A
TPH GRO	3	0	N/A	ND	500	NA	N/A
TPH ORO	6	1	1.55	8,720	5,610	NA	N/A
Total Metals							
Aluminum	1	1	1.00	8,300,000	8,300,000	41,000,000	N
Arsenic	4	4	2.60	25,200	9,700	9,200	Y
Barium	4	4	1.15	120,000	104,550	725,000	N
Beryllium	3	3	1.72	806	470	800	Y
Cadmium	4	1	2.62	1,080	412	<1,000	Y
Calcium	1	1	1.00	23,700,000	23,700,000	3,300,000	Y
Chromium	4	4	1.96	30,900	15,800	58,000	N
Cobalt	1	1	1.00	6,940	6,940	10,000	N
Copper	3	3	1.20	16,000	13,317	13,000	Y
Iron	1	1	1.00	18,200,000	18,200,000	21,000,000	N
Lead	4	4	1.86	20,100	10,833	21,800	N
Manganese	2	2	1.80	740,000	410,333	740,000	N
Mercury	4	1	0.94	33.8	36	39	N
Nickel	3	1	1.57	19,200	12,247	14,000	Y
Potassium	1	1	1.00	1,230,000	1,230,000	14,000,000	N
Selenium	4	1	2.23	5,200	2,336	260	Y
Silver	4	1	1.70	469	275	<700	N
Sodium	1	1	1.00	128,000	128,000	5,300,000	N
Thallium	3	1	2.15	12,800	5,967	<100	Y
Zinc	3	2	2.34	93,300	39,892	49,000	Y

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Tab (b)
Soil Constituents of Concern Summary for Construction Worker for Sub-area 3D: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			Max Detected Exceeds Background
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	
Volatile Organic Compounds (VOCs)							
1,2,4-Trimethylbenzene	13	1	0.50	4,700	9,401	NA	N/A
1,3,5-Trimethylbenzene	12	2	2.56	66	26	NA	N/A
Benzene	12	1	3.43	21	6.1	NA	N/A
Chloroethane	12	1	2.63	6.7	2.6	NA	N/A
Ethylbenzene	12	1	3.57	29	8.1	NA	N/A
Isopropylbenzene	12	2	3.60	292	81	NA	N/A
m,p-Xylene	12	2	2.02	43	21	NA	N/A
n-Butylbenzene	12	2	3.37	80	24	NA	N/A
n-Propylbenzene	12	1	3.58	30	8.4	NA	N/A
o-Xylene	12	1	3.10	12	3.9	NA	N/A
p-Isopropyltoluene	12	2	3.51	268	76	NA	N/A
sec-Butylbenzene	12	1	3.89	127	33	NA	N/A
tert-Butylbenzene	12	2	2.68	73	27	NA	N/A
Tetrachloroethene	13	2	0.47	1.9	4.1	NA	N/A
Xylenes, Total	4	1	1.00	12	12	NA	N/A
Polynuclear Aromatic Hydrocabons (PAHs)							
Benzo(a)pyrene	4	1	1.00	85	85	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	9	2	1.90	47,000	24,770	NA	N/A
TPH GRO	5	0	N/A	ND	500	NA	N/A
TPH ORO	7	1	1.55	8,720	5,610	NA	N/A
Total Metals							
Aluminum	1	1	1.00	8,300,000	8,300,000	41,000,000	N
Arsenic	8	7	3.45	39,000	11,294	9,200	Y
Barium	8	8	1.31	120,000	91,275	725,000	N
Beryllium	3	3	1.72	806	470	800	Y
Cadmium	8	1	4.02	1,080	269	<1,000	Y
Calcium	1	1	1.00	23,700,000	23,700,000	3,300,000	Y
Chromium	8	8	2.27	30,900	13,625	58,000	N
Cobalt	1	1	1.00	6,940	6,940	10,000	N
Copper	3	3	1.20	16,000	13,317	13,000	Y
Iron	1	1	1.00	18,200,000	18,200,000	21,000,000	N
Lead	8	8	2.23	20,100	9,016	21,800	N
Manganese	3	3	1.80	740,000	410,333	740,000	N
Mercury	8	2	1.33	33.8	25	39	N
Nickel	3	3	1.57	19,200	12,247	14,000	Y
Potassium	1	1	1.00	1,230,000	1,230,000	14,000,000	N
Selenium	8	1	4.02	5,200	1,293	260	Y
Silver	8	1	2.34	469	200	<700	N
Sodium	1	1	1.00	128,000	128,000	5,300,000	N
Thallium	3	1	2.15	12,800	5,967	<100	Y
Zinc	3	2	2.34	93,300	39,892	49,000	Y

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4E-8(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Sub-area 3E: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Acetone	2	2	1.42	80	57	NA	N/A
Benzene	4	3	1.90	1,340	704	NA	N/A
Ethylbenzene	4	4	1.66	307	185	NA	N/A
Isopropylbenzene	3	2	1.04	29	28	NA	N/A
Methyl ter-butyl ether	3	1	0.15	20	134	NA	N/A
Methylene chloride	3	1	0.48	16	33	NA	N/A
Naphthalene	3	1	0.75	15	20	NA	N/A
n-Butylbenzene	3	2	1.27	91	72	NA	N/A
n-Propylbenzene	3	2	1.04	120	115	NA	N/A
sec-Butylbenzene	3	2	1.37	43	32	NA	N/A
Toluene	4	3	1.91	719	377	NA	N/A
Xylenes, Total	3	3	1.62	586	362	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	2	0	N/A	ND	2,312	NA	N/A
TPH GRO	2	2	1.81	496,000	274,550	NA	N/A
TPH ORO	2	0	N/A	ND	2,844	NA	N/A
Total Metals							
Lead	1	1	1.00	8,100	8,100	21,800	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4E-8(b)
Soil Constituents of Concern Summary for Construction Worker for Sub-area 3E: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Acetone	2	2	1.42	80	57	NA	N/A
Benzene	4	3	1.90	1,340	704	NA	N/A
Ethylbenzene	4	4	1.66	307	185	NA	N/A
Isopropylbenzene	3	2	1.04	29	28	NA	N/A
Methyl ter-butyl ether	3	1	0.15	20	134	NA	N/A
Methylene chloride	3	1	0.48	16	33	NA	N/A
Naphthalene	3	1	0.75	15	20	NA	N/A
n-Butylbenzene	3	2	1.27	91	72	NA	N/A
n-Propylbenzene	3	2	1.04	120	115	NA	N/A
sec-Butylbenzene	3	2	1.37	43	32	NA	N/A
Toluene	4	3	1.91	719	377	NA	N/A
Xylenes, Total	3	3	1.62	586	362	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	2	0	N/A	ND	2,312	NA	N/A
TPH GRO	2	2	1.81	496,000	274,550	NA	N/A
TPH ORO	2	0	N/A	ND	2,844	NA	N/A
Total Metals							
Lead	1	1	1.00	8,100	8,100	21,800	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4F-8(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Sub-area 3F: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
None	1	0	N/A	ND	N/A	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	2	0	N/A	ND	N/A	NA	N/A
TPH GRO	2	0	N/A	ND	N/A	NA	N/A
TPH ORO	2	0	N/A	ND	N/A	NA	N/A

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4F-8(b)
Soil Constituents of Concern Summary for Construction Worker for Sub-area 3F: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
None	2	0	N/A	ND	N/A	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	2	0	N/A	ND	N/A	NA	N/A
TPH GRO	2	0	N/A	ND	N/A	NA	N/A
TPH ORO	2	0	N/A	ND	N/A	NA	N/A
Total Metals							
Lead	2	2	1.17	8,780	7,485	21,800	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4G-8(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Sub-area 3G: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
1,2,4-Trimethylbenzene	2	2	1.43	1,200	840	NA	N/A
1,3,5-Trimethylbenzene	2	1	1.04	340	326	NA	N/A
Acetone	2	2	1.00	820	820	NA	N/A
Benzene	5	4	1.71	939	548	NA	N/A
Ethylbenzene	5	4	1.19	1,200	1,010	NA	N/A
m.p-Xylene	2	2	1.43	3,800	2,650	NA	N/A
Methyl ter-butyl ether	3	2	0.48	180	378	NA	N/A
Naphthalene	2	1	0.69	330	478	NA	N/A
o-Xylene	2	2	1.34	2,000	1,490	NA	N/A
p-Isopropyltoluene	2	1	1.25	520	416	NA	N/A
Toluene	5	4	1.33	7,600	5,700	NA	N/A
Xylenes, Total	3	2	1.01	3,600	3,550	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	2	1	1.00	85,750	85,750	NA	N/A
TPH GRO	2	1	1.00	3,280	3,280	NA	N/A
TPH ORO	2	1	1.00	1,470,000	1,470,000	NA	N/A
Total Metals							
Lead	2	2	1.15	13,400	11,655	21,800	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4G-8(b)
Soil Constituents of Concern Summary for Construction Worker for Sub-area 3G: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
1,2,4-Trimethylbenzene	2	2	1.43	1,200	840	NA	N/A
1,3,5-Trimethylbenzene	2	1	1.04	340	326	NA	N/A
Acetone	2	2	1.00	820	820	NA	N/A
Benzene	5	4	1.71	939	548	NA	N/A
Ethylbenzene	5	4	1.19	1,200	1,010	NA	N/A
m.p-Xylene	2	2	1.43	3,800	2,650	NA	N/A
Methyl ter-butyl ether	3	2	0.48	180	378	NA	N/A
Naphthalene	2	1	0.69	330	478	NA	N/A
o-Xylene	2	2	1.34	2,000	1,490	NA	N/A
p-Isopropyltoluene	2	1	1.25	520	416	NA	N/A
Toluene	5	4	1.33	7,600	5,700	NA	N/A
Xylenes, Total	3	2	1.01	3,600	3,550	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	2	1	1.00	85,750	85,750	NA	N/A
TPH GRO	2	1	1.00	3,280	3,280	NA	N/A
TPH ORO	2	1	1.00	1,470,000	1,470,000	NA	N/A
Total Metals							
Lead	2	2	1.15	13,400	11,655	21,800	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4H-8(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Sub-area 3H: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	0	0	N/A	ND	N/A	NA	N/A
TPH GRO	0	0	N/A	ND	N/A	NA	N/A
TPH ORO	0	0	N/A	ND	N/A	NA	N/A

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4H-8(b)
Soil Constituents of Concern Summary for Construction Worker for Sub-area 3H: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Acetone	1	1	1.00	21	21	NA	N/A
Methyl ethyl ketone (MEK)	1	1	1.00	8.8	8.80	NA	N/A
Methylene chloride	1	1	1.00	4.5	4.5	NA	N/A
Xylenes, Total	3	1	1.58	9.4	6.0	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	3	3	1.52	55,000	36,120	NA	N/A
TPH GRO	2	0	N/A	ND	375	NA	N/A
TPH ORO	1	0	N/A	ND	3,159	NA	N/A
Total Metals							
Lead	1	1	1.00	8,630	8,630	21,800	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4A-9
Groundwater Constituents of Concern Summary for Sub-area 3A: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
1,2,4-Trimethylbenzene	9	1	1.68	13	7.8	2.6	Y
Benzene	14	2	1.95	135	69	5	Y
cis-1,2-Dichloroethene	9	1	1.99	760	381	70	Y
Ethylbenzene	14	1	2.91	20	6.9	700	N
Isopropylbenzene	9	2	1.04	24	23	4,000	N
m.p-Xylene	9	1	1.85	31	17	185	N
Methyl ter-butyl ether	9	1	1.66	24	15	146	N
n-Propylbenzene	9	2	1.65	117	71	5.3	Y
p-Isopropyltoluene	9	1	1.93	68	35	107	N
sec-Butylbenzene	9	1	1.34	41	31	48.6	N
Toluene	14	1	1.83	6.3	3.5	1,000	N
trans-1,2-Dichloroethene	9	1	1.85	31	17	100	N
Vinyl chloride	9	1	1.66	12	7.3	2	Y
Xylenes, Total	5	1	1.00	14	14	10,000	N
Polynuclear Aromatic Hydrocabons (PAHs)							
None	2	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	11	5	4.87	34,000	6,983	NA	N/A
TPH GRO	6	2	1.89	2,000	1,060	NA	N/A
TPH ORO	11	2	4.62	6,695	1,449	NA	N/A
Total Metals							
Arsenic	1	1	1.00	100	100	10	Y
Barium	1	1	1.00	960	960	2,000	N
Chromium	1	1	1.00	64	64	100	N
Lead	5	1	2.78	110	40	15	Y

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4B-9
Groundwater Constituents of Concern Summary for Sub-area 3B: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
Acetone	3	2	1.23	16	13	121	N
Isopropylbenzene	3	2	1.38	7.8	5.7	4,000	N
Methylene chloride	3	2	0.52	3.5	6.8	49.1	N
Naphthalene	3	2	1.15	10	8.7	100	N
n-Propylbenzene	3	2	1.41	8.6	6.1	5.3	Y
sec-Butylbenzene	3	1	1.02	2.6	2.6	48.6	N
Xylenes, Total	3	1	1.91	52	27	10,000	N
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	4	3	2.35	1,240	529	NA	N/A
TPH GRO	4	2	3.40	11,310	3,328	NA	N/A
TPH ORO	4	1	0.96	259	271	NA	N/A
Total Metals							
Lead	2	1	1.35	46	34	15	Y

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4C-9
Groundwater Constituents of Concern Summary for Sub-area 3C: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
1,1,1-Trichloroethane	8	1	0.15	2.1	14	200	N
1,1,2-Trichloro-1,2,2-Trifluoroethane	8	1	0.39	5.9	15	12.3	N
1,1-Dichloroethane	8	3	0.27	4.0	15	157	N
1,1-Dichloroethene	8	1	0.16	2.3	14	7.0	N
Benzene	23	1	14.35	1,720	120	5	Y
Carbon Tetrachloride	8	1	0.32	4.7	15	5	N
Chloroform	8	1	0.32	9.3	29	400	N
cis-1,2-Dichloroethene	8	2	0.58	8.9	15	70	N
Ethylbenzene	23	2	0.74	12	16	700	N
Isopropylbenzene	8	2	5.87	1,100	188	4,000	N
Methyl ter-butyl ether	23	2	7.73	270	35	146	Y
Methylene chloride	8	1	0.10	5.5	57	49.1	N
n-Butylbenzene	8	1	5.78	1,200	208	48.6	Y
n-Propylbenzene	8	2	5.84	1,300	223	5.3	Y
sec-Butylbenzene	8	2	5.80	1,000	172	48.6	Y
Toluene	23	4	7.49	800	107	1,000	N
Xylenes, Total	15	4	6.32	3,100	491	10,000	N
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	15	6	12.14	2,920,000	240,467	NA	N/A
TPH GRO	16	9	6.38	364,000	57,052	NA	N/A
TPH ORO	14	3	0.10	2,950	29,569	NA	N/A
Total Metals							
None	3	0	N/A	ND	N/A	N/A	N/A

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4D-9
Groundwater Constituents of Concern Summary for Sub-area 3D: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
1,1-Dichloroethane	17	2	7.55	110	15	157	N
1,1-Dichloroethene	17	2	3.85	10	3	7.0	Y
1,4-Dioxane	4	1	2.63	36	14	300	N
Acetone	6	1	1.06	15	14	121	N
Benzene	20	2	2.96	6.3	2.1	5	Y
Chloroethane	17	1	3.11	7.3	2.4	48.8	N
cis-1,2-Dichloroethene	17	5	4.70	45	10	70	N
Methyl ethyl ketone (MEK)	6	1	1.05	8.8	8.4	4,000	N
Methyl isobutyl ketone	6	1	0.38	2.9	7.6	32.7	N
Methylene chloride	17	3	2.98	7.2	2.4	49.1	N
Tetrachloroethene	17	5	3.74	23	6.2	5	Y
trans-1,2-Dichloroethene	17	3	3.74	12	3.2	100	N
Trichloroethene	17	5	3.30	11	3.3	5	Y
Trichlorofluoromethane	17	1	4.77	17	3.6	2,000	N
Vinyl chloride	17	3	2.86	8.4	2.9	2	Y
Polynuclear Aromatic Hydrocabons (PAHs)							
None	6	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	9	3	1.10	208	190	NA	N/A
TPH GRO	3	0	N/A	ND	500	NA	N/A
TPH ORO	1	0	N/A	ND	75	NA	N/A
Total Metals							
Arsenic	7	2	3.88	98	25	10	Y
Barium	7	7	5.06	10,000	1,978	2,000	Y
Cadmium	7	1	5.23	43	8.2	5	Y
Chromium	7	6	4.75	320	67.36	100	Y
Copper	2	2	1.20	6.0	5.0	1,300	N
Lead	7	4	2.68	110	41.07	15	Y
Manganese	2	2	1.80	3,870	2,156	50	Y
Mercury	7	1	2.48	0.33	0.13	2	N
Zinc	2	1	1.70	28	17	2,000	N

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4E-9
Groundwater Constituents of Concern Summary for Sub-area 3E: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
1,2,4-Trimethylbenzene	2	1	1.00	2,500	2,500	2.6	Y
1,3,5-Trimethylbenzene	2	1	1.00	620	620	10,000	N
Acetone	1	1	1.00	540.0	540	121	Y
Ethylbenzene	5	4	2.17	2,700	1,245	700	Y
m,p-Xylene	2	1	1.00	5,300	5,300	185	Y
Naphthalene	2	1	1.00	930	930	100	Y
n-Propylbenzene	2	1	1.00	380	380	5.3	Y
Toluene	5	1	0.04	5.2	128	1,000	N
Xylenes, Total	3	3	2.09	4,770	2,288	10,000	N
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	3	1	2.00	99,800	50,025	NA	N/A
TPH GRO	3	1	0.31	9,000	29,500	NA	N/A
TPH ORO	3	1	0.45	2,200	4,850	NA	N/A
Total Metals							
Lead	1	1	1.00	71	71	15	Y

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4F-9
Groundwater Constituents of Concern Summary for Sub-area 3F: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
None	2	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	2	1	1.00	514	514	NA	N/A
TPH GRO	2	0	N/A	ND	500	NA	N/A
TPH ORO	2	1	1.00	1,543	1,543	NA	N/A
Total Metals							
None	1	0	N/A	N/A	N/A	N/A	N/A

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4G-9
Groundwater Constituents of Concern Summary for Sub-area 3G: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
1,2,4-Trimethylbenzene	1	1	1.00	5.5	5.5	2.6	Y
1,3,5-Trimethylbenzene	1	1	1.00	3.1	3.1	10,000	N
Acetone	1	1	1.00	34	34	121	N
Benzene	3	2	2.63	1,270	484	5	Y
Ethylbenzene	3	2	3.33	213	64	700	N
Isopropylbenzene	1	1	1.00	2.1	2.1	4,000	N
m,p-Xylene	1	1	1.00	36	36	185	N
Methyl ethyl ketone (MEK)	1	1	1.00	10	10	4,000	N
Methyl ter-butyl ether	3	3	1.64	60.2	37	146	N
Methylene chloride	1	1	1.00	2.3	2.3	49.1	N
Naphthalene	1	1	1.00	18	18	100	N
n-Propylbenzene	1	1	1.00	3.7	3.7	5.3	N
o-Xylene	1	1	1.00	22	22	185.0	N
p-Isopropyltoluene	1	1	1.00	3.3	3.3	107	N
Toluene	3	2	2.58	642	249	1,000	N
Xylenes, Total	2	1	1.99	349	176	10,000	N
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	3	2	1.68	3,360	2,000	NA	N/A
TPH GRO	3	1	1.33	6,680	5,040	NA	N/A
TPH ORO	3	1	1.24	3,780	3,040	NA	N/A
Total Metals							
None	1	0	N/A	ND	N/A	N/A	N/A

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4H-9
Groundwater Constituents of Concern Summary for Sub-area 3H: Retained Area
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
1,2-Dichlorobenzene	4	3	1.30	3.7	2.9	600	N
Carbon Disulfide	2	1	0.59	2.1	3.6	201	N
Methylene chloride	3	1	0.76	5.3	7.0	49.1	N
Toluene	6	1	0.91	2.2	2.4	1,000	N
Polynuclear Aromatic Hydrocabons (PAHs)							
Acenaphthene	1	1	1.00	7.8	7.8	2,000	N
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	4	3	1.40	3,540	2,520	NA	N/A
TPH GRO	3	0	N/A	ND	275	NA	N/A
TPH ORO	2	0	N/A	ND	213	NA	N/A
Total Metals							
Arsenic	1	1	1.00	80	80	10	Y
Barium	1	1	1.00	1,910	1,910	2,000	N
Chromium	1	1	1.00	14	14	100	N
Copper	1	1	1.00	17	17	1,300	N
Lead	2	1	1.51	68	45	15	Y
Manganese	1	1	1.00	8,860	8,860	50	Y
Mercury	1	1	1.00	0.5	0.5	2	N
Nickel	1	1	1.00	23	23	100	N
Zinc	1	1	1.00	378	378	2,000	N

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 4A-10(a)

Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker

Sub-area 3A: Retained Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc. (ug/kg)	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
		IELCR	HQ		IELCR	HQ		
1,2,4-Trimethylbenzene	27	NA	1.50E-06	7.8	NA	6.86E-05	NA	7.01E-05
1,3,5-Trimethylbenzene	97	NA	3.48E-05	---	---	---	NA	3.48E-05
Benzene	10	6.27E-10	3.56E-05	69	1.15E-08	1.15E-03	1.22E-08	1.19E-03
cis-1,2-Dichloroethene	---	---	---	381	NA	3.97E-04	NA	3.97E-04
Ethylbenzene	6.5	NA	2.78E-08	---	---	---	NA	2.78E-08
Isopropylbenzene	16	NA	1.54E-06	---	---	---	NA	1.54E-06
m,p-Xylene	15	NA	2.42E-07	---	---	---	NA	2.42E-07
Methylene chloride	4.0	2.46E-11	4.86E-08	---	---	---	2.46E-11	4.86E-08
n-Propylbenzene	---	---	---	71	NA	4.47E-05	NA	4.47E-05
p-Isopropyltoluene	59	NA	1.50E-07	---	---	---	NA	1.50E-07
Toluene	15	NA	3.09E-07	---	---	---	NA	3.09E-07
Vinyl chloride	---	---	---	7.3	6.68E-08	6.68E-03	6.68E-08	6.68E-03
Xylenes, Total	6.7	NA	3.20E-08	---	---	---	NA	3.20E-08
Organics Total Risk		**6.52E-10**	**7.43E-05**		**7.84E-08**	**8.35E-03**	**7.90E-08**	**8.42E-03**
TPH-GRO	---	---	---	1,060	NA	7.83E-03	NA	7.83E-03
TPH-DRO	24,000	NA	2.43E-05	6,983	NA	1.68E+00	NA	1.68E+00
TPH-ORO	2,500	NA	6.40E-08	1,449	NA	9.23E-01	NA	9.23E-01
TPH Total Risk		**NA**	**2.44E-05**		**NA**	**2.61E+00**	**NA**	**2.61E+00**
Arsenic	---	---	---	100	NA	NA	NA	NA
Metals Total Risk		**NA**	**NA**		**NA**	**NA**	**NA**	**NA**
CUMULATIVE RISK		**6.52E-10**	**9.87E-05**		**7.84E-08**	**2.62E+00**	**7.90E-08**	**2.62E+00**

Notes:

NA: Not available

---: Risk evaluation was not performed.

HI: Hazard index

TPH: Total petroleum hydrocarbon

DRO: Diesel range organic

GRO: Gasoline range organic

ORO: Oil range organic

ug/kg: Micrograms per kilogram

ug/L: Micrograms per liter

Table 4A-10(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 3A: Retained Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
1,2,4-Trimethylbenzene	11	NA	7.57E-08	NA	8.41E-08	NA	1.61E-06	7.8	NA	NA	NA	1.64E-06	NA	3.41E-06
1,3,5-Trimethylbenzene	31	NA	2.16E-07	NA	2.40E-07	NA	1.15E-05	—	—	—	—	—	NA	1.20E-05
Benzene	37	5.35E-12	4.30E-06	5.94E-12	4.78E-06	3.03E-11	4.31E-05	69	1.33E-08	1.07E-02	1.21E-11	1.72E-05	1.34E-08	1.08E-02
cis-1,2-Dichloroethene	—	—	—	—	—	—	—	381	NA	NA	NA	1.34E-05	NA	1.34E-05
Ethylbenzene	10	NA	3.65E-08	NA	3.73E-08	NA	3.27E-08	—	—	—	—	—	NA	1.07E-07
Isopropylbenzene	19	NA	6.48E-08	NA	7.20E-08	NA	4.50E-07	—	—	—	—	—	NA	5.87E-07
m,p-Xylene	11	NA	6.56E-09	NA	2.19E-09	NA	1.07E-07	—	—	—	—	—	NA	1.15E-07
Methylene chloride	7.5	2.82E-13	4.38E-08	3.13E-13	4.87E-08	4.70E-13	2.33E-08	—	—	—	—	—	1.07E-12	1.16E-07
n-Propylbenzene	19	NA	6.75E-06	NA	7.50E-06	NA	3.55E-07	71	NA	NA	NA	9.52E-07	NA	1.56E-05
p-Isopropyltoluene	21	NA	2.42E-07	NA	8.06E-08	NA	9.22E-08	—	—	—	—	—	NA	4.15E-07
sec-Butylbenzene	26	NA	7.61E-07	NA	2.54E-07	NA	3.73E-07	—	—	—	—	—	NA	1.39E-06
Toluene	8.2	NA	1.42E-09	NA	1.58E-08	NA	8.98E-08	—	—	—	—	—	NA	1.07E-07
Vinyl chloride	—	—	—	—	—	—	—	7.3	3.18E-08	3.91E-04	4.45E-11	3.64E-07	3.18E-08	3.91E-04
Xylenes, Total	20	NA	3.43E-09	NA	3.50E-09	NA	7.82E-08	—	—	—	—	—	NA	8.51E-08
Organics Total Risk		**5.63E-12**	**1.25E-05**	**6.25E-12**	**1.31E-05**	**3.08E-11**	**5.78E-05**		**4.51E-08**	**1.11E-02**	**5.66E-11**	**3.36E-05**	**4.52E-08**	**1.12E-02**
TPH-GRO	6,770	NA	NA	NA	3.08E-05	NA	3.99E-05	1,060	NA	NA	NA	1.30E-04	NA	2.00E-04
TPH-DRO	12,003	NA	2.65E-05	NA	8.05E-05	NA	2.30E-05	6,983	NA	NA	NA	2.76E-02	NA	2.77E-02
TPH-ORO	2,714	NA	6.91E-06	NA	1.78E-05	NA	5.60E-07	1,449	NA	NA	NA	1.52E-02	NA	1.52E-02
TPH Total Risk		**NA**	**3.34E-05**	**NA**	**1.29E-04**	**NA**	**6.35E-05**		**NA**	**NA**	**NA**	**4.28E-02**	**NA**	**4.31E-02**
Arsenic	—	—	—	—	—	—	—	100	NA	NA	NA	NA	NA	NA
Mercury	94	NA	3.64E-07	NA	1.82E-05	NA	4.39E-04	—	—	—	—	—	NA	4.58E-04
Metals Total Risk		**NA**	**3.64E-07**	**NA**	**1.82E-05**	**NA**	**4.39E-04**		**NA**	**NA**	**NA**	**NA**	**NA**	**4.58E-04**
CUMULATIVE RISK		**5.63E-12**	**4.63E-05**	**6.25E-12**	**1.60E-04**	**3.08E-11**	**5.60E-04**		**4.51E-08**	**1.11E-02**	**5.66E-11**	**4.29E-02**	**4.52E-08**	**5.47E-02**

Notes:
NA: Not available
—: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic
ORO: Oil range organic
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter

Table 4B-10(a)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker
Sub-area 3B: Retained Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ		IELCR	HQ		
Acetone	19	NA	2.15E-07	—	—	—	NA	2.15E-07
Benzene	55	3.35E-09	1.90E-04	—	—	—	3.35E-09	1.90E-04
Carbon disulfide	3.0	NA	6.85E-07	—	—	—	NA	6.85E-07
Ethylbenzene	14	NA	6.07E-08	—	—	—	NA	6.07E-08
Isopropylbenzene	4.0	NA	3.90E-07	—	—	—	NA	3.90E-07
n-Propylbenzene	2.9	NA	5.88E-08	6.1	NA	3.84E-06	NA	3.90E-06
sec-Butylbenzene	5.7	NA	6.99E-08	—	—	—	NA	6.99E-08
Toluene	5.6	NA	1.16E-07	—	—	—	NA	1.16E-07
Xylenes, Total	58	NA	2.77E-07	—	—	—	NA	2.77E-07
Organics Total Risk		**3.35E-09**	**1.92E-04**		**NA**	**3.84E-06**	**3.35E-09**	**1.96E-04**
Aliphatics > nC6 to nC8 (TX1006)	—	—	—	2,219	NA	1.57E-03	NA	1.57E-03
Aliphatics > nC8 to nC10 (TX1006)	—	—	—	555	NA	1.15E-02	NA	1.15E-02
Aromatics > nC8 to nC10 (TX1006)	—	—	—	555	NA	3.63E-04	NA	3.63E-04
TPH-GRO	**29,200**	**NA**	**2.99E-04**	**3,328**	**NA**	**1.35E-02**	**NA**	**1.38E-02**
Aliphatics > nC10 to nC12 (TX1006)	—	—	—	88	NA	2.75E-03	NA	2.75E-03
Aliphatics > nC12 to nC16 (TX1006)	—	—	—	88	NA	1.19E-02	NA	1.19E-02
Aliphatics > nC16 to nC21 (TX1006)	—	—	—	88	NA	1.12E-01	NA	1.12E-01
Aromatics > nC10 to nC12 (TX1006)	—	—	—	88	NA	1.78E-05	NA	1.78E-05
Aromatics > nC12 to nC16 (TX1006)	—	—	—	88	NA	7.08E-06	NA	7.08E-06
Aromatics > nC16 to nC21 (TX1006)	—	—	—	88	NA	1.89E-06	NA	1.89E-06
TPH-DRO	**2,081**	**NA**	**2.11E-06**	**529**	**NA**	**1.27E-01**	**NA**	**1.27E-01**
Aliphatics > nC21 to nC35 (TX1006)	—	—	—	136	NA	1.73E-01	NA	1.73E-01
Aromatics > nC21 to nC35 (TX1006)	—	—	—	136	NA	3.31E-07	NA	3.31E-07
TPH-ORO	**3,121**	**NA**	**7.99E-08**	**271**	**NA**	**1.73E-01**	**NA**	**1.73E-01**
TPH Total Risk		**NA**	**3.02E-04**		**NA**	**3.13E-01**	**NA**	**3.13E-01**
CUMULATIVE RISK		**3.35E-09**	**4.94E-04**		**NA**	**3.13E-01**	**3.35E-09**	**3.14E-01**

Notes:
NA: Not available
—: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic
ORO: Oil range organic
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter

Table 4B-10(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 3B: Retained Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
Acetone	15	NA	5.06E-08	NA	5.34E-08	NA	1.26E-07	---	---	---	---	---	NA	2.30E-07
Benzene	414	5.99E-11	4.82E-05	6.65E-11	5.35E-05	3.40E-10	4.82E-04	---	---	---	---	---	4.66E-10	5.84E-04
Carbon disulfide	4.0	NA	1.39E-08	NA	1.55E-08	NA	1.10E-07	---	---	---	---	---	NA	1.39E-07
Ethylbenzene	32	NA	1.11E-07	NA	1.13E-07	NA	9.93E-08	---	---	---	---	---	NA	3.24E-07
Isopropylbenzene	3.3	NA	1.13E-08	NA	1.26E-08	NA	7.88E-08	---	---	---	---	---	NA	1.03E-07
n-Propylbenzene	2.7	NA	9.42E-07	NA	1.05E-06	NA	4.95E-08	6.1	NA	NA	NA	8.18E-08	NA	2.12E-06
sec-Butylbenzene	7.7	NA	2.24E-07	NA	7.46E-08	NA	1.10E-07	---	---	---	---	---	NA	4.08E-07
Toluene	140	NA	2.43E-08	NA	2.70E-07	NA	1.53E-06	---	---	---	---	---	NA	1.83E-06
Xylenes, Total	282	NA	4.92E-08	NA	5.03E-08	NA	1.12E-06	---	---	---	---	---	NA	1.22E-06
Organics Total Risk		**5.99E-11**	**4.96E-05**	**6.65E-11**	**5.52E-05**	**3.40E-10**	**4.86E-04**		**NA**	**NA**	**NA**	**8.18E-08**	**4.66E-10**	**5.91E-04**
Aliphatics > nC6 to nC8 (TX1006)	---	---	---	---	---	---	---	2,219	NA	NA	NA	2.59E-05	NA	2.59E-05
Aliphatics > nC8 to nC10 (TX1006)	---	---	---	---	---	---	---	555	NA	NA	NA	1.90E-04	NA	1.90E-04
Aromatics > nC8 to nC10 (TX1006)	---	---	---	---	---	---	---	555	NA	NA	NA	7.48E-06	NA	7.48E-06
TPH-GRO	**117,333**	**NA**	**NA**	**NA**	**5.33E-04**	**NA**	**6.91E-04**	**3,328**	**NA**	**NA**	**NA**	**2.23E-04**	**NA**	**1.45E-03**
Aliphatics > nC10 to nC12 (TX1006)	---	---	---	---	---	---	---	88	NA	NA	NA	4.52E-05	NA	4.52E-05
Aliphatics > nC12 to nC16 (TX1006)	---	---	---	---	---	---	---	88	NA	NA	NA	1.96E-04	NA	1.96E-04
Aliphatics > nC16 to nC21 (TX1006)	---	---	---	---	---	---	---	88	NA	NA	NA	1.85E-03	NA	1.85E-03
Aromatics > nC10 to nC12 (TX1006)	---	---	---	---	---	---	---	88	NA	NA	NA	5.45E-07	NA	5.45E-07
Aromatics > nC12 to nC16 (TX1006)	---	---	---	---	---	---	---	88	NA	NA	NA	3.77E-07	NA	3.77E-07
Aromatics > nC16 to nC21 (TX1006)	---	---	---	---	---	---	---	88	NA	NA	NA	2.87E-07	NA	2.87E-07
TPH-DRO	**11,514**	**NA**	**2.54E-05**	**NA**	**7.72E-05**	**NA**	**2.21E-05**	**529**	**NA**	**NA**	**NA**	**2.09E-03**	**NA**	**2.21E-03**
Aliphatics > nC21 to nC35 (TX1006)	---	---	---	---	---	---	---	136	NA	NA	NA	2.84E-03	NA	2.84E-03
Aromatics > nC21 to nC35 (TX1006)	---	---	---	---	---	---	---	136	NA	NA	NA	2.61E-07	NA	2.61E-07
TPH-ORO	**2,930**	**NA**	**7.46E-06**	**NA**	**1.92E-05**	**NA**	**6.05E-07**	**271**	**NA**	**NA**	**NA**	**2.84E-03**	**NA**	**2.86E-03**
TPH Total Risk		**NA**	**3.29E-05**	**NA**	**6.30E-04**	**NA**	**7.14E-04**		**NA**	**NA**	**NA**	**5.15E-03**	**NA**	**6.52E-03**
CUMULATIVE RISK		**5.99E-11**	**8.25E-05**	**6.65E-11**	**6.85E-04**	**3.40E-10**	**1.20E-03**		**NA**	**NA**	**NA**	**5.15E-03**	**4.66E-10**	**7.11E-03**

Notes:
NA: Not available
---: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic
ORO: Oil range organic
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter

Table 4C-10(a)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker
Sub-area 3C: Retained Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc. (ug/kg)	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
		IELCR	HQ		IELCR	HQ		
Benzene	---	---	---	120	2.00E-08	2.00E-03	2.00E-08	2.00E-03
Methyl tert-butyl ether	---	---	---	35	7.68E-12	7.68E-07	7.68E-12	7.68E-07
n-Butylbenzene	---	---	---	208	NA	1.63E-04	NA	1.63E-04
n-Propylbenzene	---	---	---	223	NA	1.40E-04	NA	1.40E-04
sec-Butylbenzene	---	---	---	172	NA	1.91E-04	NA	1.91E-04
Organics Total Risk		**NA**	**NA**		**2.00E-08**	**2.50E-03**	**2.00E-08**	**2.50E-03**
TPH-GRO	---	---	---	57,052	NA	4.22E-01	NA	4.22E-01
TPH-DRO	---	---	---	240,467	NA	5.77E+01	NA	5.77E+01
TPH-ORO	---	---	---	29,569	NA	1.88E+01	NA	1.88E+01
TPH Total Risk		**NA**	**NA**		**NA**	**7.70E+01**	**NA**	**7.70E+01**
CUMULATIVE RISK		**NA**	**NA**		**2.00E-08**	**7.70E+01**	**2.00E-08**	**7.70E+01**

Notes:
NA: Not available
---: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic
ORO: Oil range organic
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter

Table 4C-10(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 3C: Retained Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
Acetone	32	NA	1.12E-07	NA	1.18E-07	NA	2.77E-07	---	---	---	---	---	NA	5.07E-07
Benzene	79	1.14E-11	9.15E-06	1.26E-11	1.02E-05	6.46E-11	9.17E-05	120	2.31E-08	1.86E-02	2.10E-11	2.98E-05	2.32E-08	1.87E-02
Isopropylbenzene	17	NA	6.04E-08	NA	6.72E-08	NA	4.20E-07	---	---	---	---	---	NA	5.48E-07
Methylene chloride	22	8.15E-13	1.27E-07	9.05E-13	1.41E-07	1.36E-12	6.72E-08	---	---	---	---	---	3.08E-12	3.35E-07
Methyl tert-butyl ether	14	2.35E-13	5.81E-09	2.62E-13	6.45E-09	9.05E-14	2.11E-08	35	1.64E-10	4.04E-06	3.44E-14	8.00E-09	1.65E-10	4.09E-06
n-Butylbenzene	22	NA	6.51E-07	NA	2.17E-07	NA	2.37E-07	208	NA	NA	NA	3.31E-06	NA	4.41E-06
n-Propylbenzene	30	NA	1.03E-05	NA	1.15E-05	NA	5.44E-07	223	NA	NA	NA	2.99E-06	NA	2.54E-05
sec-Butylbenzene	24	NA	6.92E-07	NA	2.31E-07	NA	3.39E-07	172	NA	NA	NA	3.65E-06	NA	4.91E-06
t-Butylbenzene	5.7	NA	1.65E-07	NA	5.49E-08	NA	6.64E-08	---	---	---	---	---	NA	2.86E-07
Toluene	656	NA	1.14E-07	NA	1.27E-06	NA	7.21E-06	---	---	---	---	---	NA	8.59E-06
Xylenes, Total	259	NA	4.52E-08	NA	4.62E-08	NA	1.03E-06	---	---	---	---	---	NA	1.12E-06
Organics Total Risk		**1.24E-11**	**2.15E-05**	**1.38E-11**	**2.38E-05**	**6.60E-11**	**1.02E-04**		**2.33E-08**	**1.86E-02**	**2.10E-11**	**3.98E-05**	**2.34E-08**	**1.88E-02**
TPH-GRO	47,350	NA	NA	NA	2.15E-04	NA	2.79E-04	57,052	NA	NA	NA	6.99E-03	NA	7.48E-03
TPH-DRO	311,290	NA	6.87E-04	NA	2.09E-03	NA	5.97E-04	240,467	NA	NA	NA	9.49E-01	NA	9.52E-01
TPH-ORO	33,290	NA	8.48E-05	NA	2.18E-04	NA	6.87E-06	29,569	NA	NA	NA	3.09E-01	NA	3.10E-01
TPH Total Risk		**NA**	**7.71E-04**	**NA**	**2.52E-03**	**NA**	**8.83E-04**		**NA**	**NA**	**NA**	**1.27E+00**	**NA**	**1.27E+00**
CUMULATIVE RISK		**1.24E-11**	**7.93E-04**	**1.38E-11**	**2.54E-03**	**6.60E-11**	**9.85E-04**		**2.33E-08**	**1.86E-02**	**2.10E-11**	**1.27E+00**	**2.34E-08**	**1.29E+00**

Notes:
NA: Not available
---: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic
ORO: Oil range organic
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter

Table 4D-10(a)

Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker

Sub-area 3D: Retained Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc. (ug/kg)	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
		IELCR	HQ		IELCR	HQ		
1,1-Dichloroethene	---	---	---	2.6	8.83E-09	8.83E-04	8.83E-09	8.83E-04
1,2,4-Trimethylbenzene	15,668	NA	3.20E-05	---	---	---	NA	3.20E-05
1,3,5-Trimethylbenzene	18	NA	2.38E-07	---	---	---	NA	2.38E-07
Benzene	11	2.39E-11	1.36E-06	2.1	2.43E-10	2.43E-05	2.67E-10	2.57E-05
Chloroethane	3.6	5.61E-12	1.87E-09	---	---	---	5.61E-12	1.87E-09
Isopropylbenzene	16	NA	5.59E-08	---	---	---	NA	5.59E-08
m,p-Xylene	21	NA	1.24E-08	---	---	---	NA	1.24E-08
n-Butylbenzene	7.3	NA	1.25E-08	---	---	---	NA	1.25E-08
n-Propylbenzene	15	NA	1.12E-08	---	---	---	NA	1.12E-08
o-Xylene	6.3	NA	4.00E-11	---	---	---	NA	4.00E-11
p-Isopropyltoluene	18	NA	1.69E-09	---	---	---	NA	1.69E-09
sec-Butylbenzene	64	NA	2.84E-08	---	---	---	NA	2.84E-08
tert-Butylbenzene	18	NA	5.35E-09	---	---	---	NA	5.35E-09
Tetrachloroethene	5.3	8.83E-13	1.07E-08	6.2	1.33E-10	1.33E-05	1.34E-10	1.33E-05
Trichloroethene	---	---	---	3.3	1.30E-10	1.30E-05	1.30E-10	1.30E-05
Vinyl chloride	---	---	---	2.9	1.99E-08	1.99E-03	1.99E-08	1.99E-03
Xylenes, Total	12	NA	2.09E-09	---	---	---	NA	2.09E-09
Organics Total Risk		**3.04E-11**	**3.37E-05**		**2.92E-08**	**2.92E-03**	**2.93E-08**	**2.96E-03**
TPH-GRO	500	NA	1.86E-07	500	NA	2.72E-03	NA	2.72E-03
TPH-DRO	24,770	NA	9.12E-07	190	NA	3.36E-02	NA	3.36E-02
TPH-ORO	5,610	NA	5.22E-09	75	NA	3.52E-02	NA	3.52E-02
TPH Total Risk		**NA**	**1.10E-06**		**NA**	**7.16E-02**	**NA**	**7.16E-02**
Arsenic	9,700	NA	NA	25	NA	NA	NA	NA
Barium	---	---	---	1,978	NA	NA	NA	NA
Beryllium	470	NA	NA	---	---	---	NA	NA
Cadmium	412	NA	NA	8.2	NA	NA	NA	NA
Chromium	---	---	---	67	NA	NA	NA	NA
Copper	13,317	NA	NA	---	---	---	NA	NA
Manganese	---	---	---	2,156	NA	NA	NA	NA
Nickel	12,247	NA	NA	---	---	---	NA	NA
Selenium	2,336	NA	NA	---	---	---	NA	NA
Thallium	5,967	NA	NA	---	---	---	NA	NA
Zinc	39,892	NA	NA	---	---	---	NA	NA
Metals Total Risk		**NA**	**NA**		**NA**	**NA**	**NA**	**NA**
CUMULATIVE RISK		**3.04E-11**	**3.48E-05**		**2.92E-08**	**7.45E-02**	**2.93E-08**	**7.45E-02**

Notes:

NA: Not available

---: Risk evaluation was not performed.

HI: Hazard index

TPH: Total petroleum hydrocarbon

DRO: Diesel range organic

GRO: Gasoline range organic

ORO: Oil range organic

ug/kg: Micrograms per kilogram

ug/L: Micrograms per liter

Table 4D-10(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 3D: Retained Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
1,1-Dichloroethene	—	—	—	—	—	—	—	2.6	3.95E-09	5.12E-05	4.05E-12	2.84E-08	3.95E-09	5.12E-05
1,2,4-Trimethylbenzene	9,401	NA	6.56E-05	NA	7.29E-05	NA	1.39E-03	—	—	—	—	—	NA	1.53E-03
1,3,5-Trimethylbenzene	26	NA	1.80E-07	NA	2.00E-07	NA	9.59E-06	—	—	—	—	—	NA	9.97E-06
Benzene	6.1	8.85E-13	7.12E-07	9.83E-13	7.91E-07	5.02E-12	7.13E-06	2.1	4.09E-10	3.29E-04	1.67E-13	2.38E-07	4.16E-10	3.38E-04
Chloroethane	2.6	1.23E-13	7.41E-09	4.09E-14	2.47E-09	5.53E-13	4.61E-09	—	—	—	—	—	7.17E-13	1.45E-08
Ethylbenzene	8.1	NA	2.83E-08	NA	2.90E-08	NA	2.53E-08	—	—	—	—	—	NA	8.26E-08
Isopropylbenzene	81	NA	2.82E-07	NA	3.14E-07	NA	1.96E-06	—	—	—	—	—	NA	2.56E-06
m,p-Xylene	21	NA	1.24E-08	NA	4.12E-09	NA	2.01E-07	—	—	—	—	—	NA	2.17E-07
n-Butylbenzene	24	NA	6.90E-07	NA	2.30E-07	NA	6.66E-07	—	—	—	—	—	NA	1.59E-06
n-Propylbenzene	8.4	NA	2.92E-06	NA	3.25E-06	NA	1.53E-07	—	—	—	—	—	NA	6.32E-06
o-Xylene	3.9	NA	2.25E-09	NA	7.51E-10	NA	3.79E-09	—	—	—	—	—	NA	6.79E-09
p-Isopropyltoluene	76	NA	8.86E-07	NA	2.95E-07	NA	3.38E-07	—	—	—	—	—	NA	1.52E-06
sec-Butylbenzene	33	NA	9.48E-07	NA	3.16E-07	NA	4.65E-07	—	—	—	—	—	NA	1.73E-06
tert-Butylbenzene	27	NA	7.92E-07	NA	2.64E-07	NA	3.19E-07	—	—	—	—	—	NA	1.38E-06
Tetrachloroethene	4.1	1.05E-13	1.42E-08	1.17E-12	1.57E-07	2.41E-13	7.27E-08	6.2	4.86E-09	6.54E-04	6.50E-14	1.96E-08	4.86E-09	6.55E-04
Trichloroethene	—	—	—	—	—	—	—	3.3	1.85E-10	1.97E-04	7.29E-14	8.56E-08	1.86E-10	1.97E-04
Vinyl chloride	—	—	—	—	—	—	—	2.9	1.29E-08	1.58E-04	8.06E-12	6.59E-08	1.29E-08	1.58E-04
Xylenes, Total	12	NA	2.09E-09	NA	2.14E-09	NA	4.78E-08	—	—	—	—	—	NA	5.20E-08
Benzo(a)pyrene	85	1.34E-09	NA	2.92E-09	NA	7.84E-12	NA	—	—	—	—	—	4.27E-09	NA
Organics Total Risk		**1.34E-09**	**7.30E-05**	**2.92E-09**	**7.87E-05**	**1.37E-11**	**1.41E-03**		**2.23E-08**	**1.39E-03**	**1.24E-11**	**4.37E-07**	**2.66E-08**	**2.95E-03**
TPH-GRO	500	NA	NA	NA	2.27E-06	NA	2.95E-06	500	NA	NA	NA	2.74E-05	NA	3.26E-05
TPH-DRO	24,770	NA	5.46E-05	NA	1.66E-04	NA	4.75E-05	190	NA	NA	NA	3.35E-04	NA	6.04E-04
TPH-ORO	5,610	NA	1.43E-05	NA	3.68E-05	NA	1.16E-06	75	NA	NA	NA	3.51E-04	NA	4.03E-04
TPH Total Risk		**NA**	**6.89E-05**	**NA**	**2.05E-04**	**NA**	**5.16E-05**		**NA**	**NA**	**NA**	**7.14E-04**	**NA**	**1.04E-03**
Arsenic	11,294	2.81E-10	4.38E-05	8.91E-08	1.39E-02	1.48E-10	2.31E-06	25	NA	NA	NA	NA	8.95E-08	1.39E-02
Barium	—	—	—	—	—	—	—	1,978	NA	NA	NA	NA	NA	NA
Beryllium	470	3.35E-10	2.73E-06	1.12E-10	9.10E-07	3.45E-12	5.04E-09	—	—	—	—	—	4.51E-10	3.64E-06
Cadmium	269	NA	6.24E-06	NA	2.08E-04	1.48E-12	3.29E-08	8.2	NA	NA	NA	NA	1.48E-12	2.14E-04
Chromium	—	—	—	—	—	—	—	67	NA	NA	NA	NA	NA	NA
Copper	13,317	NA	3.87E-06	NA	1.29E-04	NA	2.85E-06	—	—	—	—	—	NA	1.36E-04
Manganese	—	—	—	—	—	—	—	2,156	NA	NA	NA	NA	NA	NA
Nickel	12,247	NA	3.56E-07	NA	2.37E-05	9.00E-12	1.31E-05	—	—	—	—	—	9.00E-12	3.72E-05
Selenium	1,293	NA	3.01E-05	NA	1.00E-04	NA	2.77E-05	—	—	—	—	—	NA	1.58E-04
Thallium	5,967	NA	8.67E-04	NA	2.89E-02	NA	4.57E-06	—	—	—	—	—	NA	2.98E-02
Zinc	39,892	NA	1.55E-06	NA	1.29E-05	NA	8.14E-09	—	—	—	—	—	NA	1.44E-05
Metals Total Risk		**6.17E-10**	**9.56E-04**	**8.92E-08**	**4.32E-02**	**1.62E-10**	**5.06E-05**		**NA**	**NA**	**NA**	**NA**	**9.00E-08**	**4.42E-02**
CUMULATIVE RISK		**1.96E-09**	**1.10E-03**	**9.21E-08**	**4.35E-02**	**1.76E-10**	**1.51E-03**		**2.23E-08**	**1.39E-03**	**1.24E-11**	**7.14E-04**	**1.17E-07**	**4.82E-02**

Notes:
NA: Not available
—: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic
ORO: Oil range organic
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter

Table 4E-10(a)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker
Sub-area 3E: Retained Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ		IELCR	HQ		
1,2,4-Trimethylbenzene	---	---	---	2,500	NA	1.93E-02	NA	1.93E-02
Acetone	57	NA	6.36E-07	540	NA	1.43E-06	NA	2.07E-06
Benzene	704	4.29E-08	2.44E-03	---	---	---	4.29E-08	2.44E-03
Ethylbenzene	185	NA	7.85E-07	1,245	NA	7.12E-05	NA	7.19E-05
Isopropylbenzene	28	NA	2.72E-06	---	---	---	NA	2.72E-06
Methyl tert-butyl ether	134	4.04E-11	3.75E-07	---	---	---	4.04E-11	3.75E-07
Methylene chloride	33	2.04E-10	4.05E-07	---	---	---	2.04E-10	4.05E-07
m,p-Xylene	---	---	---	5,300	NA	6.41E-04	NA	6.41E-04
Naphthalene	20	NA	2.67E-07	930	NA	1.14E-03	NA	1.14E-03
n-Butylbenzene	72	NA	4.81E-07	---	---	---	NA	4.81E-07
n-Propylbenzene	115	NA	2.32E-06	380	NA	2.05E-04	NA	2.08E-04
sec-Butylbenzene	32	NA	3.84E-07	---	---	---	NA	3.84E-07
Toluene	377	NA	7.81E-06	---	---	---	NA	7.81E-06
Xylenes, total	362	NA	1.72E-06	---	---	---	NA	1.72E-06
Organics Total Risk		4.31E-08	2.45E-03		NA	2.14E-02	4.31E-08	2.38E-02
Aliphatics > nC6 to nC8 (TX1006)	---	---	---	4,917	NA	2.87E-03	NA	2.87E-03
Aliphatics > nC8 to nC10 (TX1006)	---	---	---	4,917	NA	8.43E-02	NA	8.43E-02
Aromatics > nC8 to nC10 (TX1006)	---	---	---	19,667	NA	1.10E-02	NA	1.10E-02
TPH-GRO	274,550	NA	2.80E-03	29,500	NA	9.82E-02	NA	1.01E-01
Aliphatics > nC10 to nC12 (TX1006)	---	---	---	8,338	NA	2.14E-01	NA	2.14E-01
Aliphatics > nC12 to nC16 (TX1006)	---	---	---	8,338	NA	9.29E-01	NA	9.29E-01
Aliphatics > nC16 to nC21 (TX1006)	---	---	---	8,338	NA	8.75E+00	NA	8.75E+00
Aromatics > nC10 to nC12 (TX1006)	---	---	---	8,338	NA	1.51E-03	NA	1.51E-03
Aromatics > nC12 to nC16 (TX1006)	---	---	---	8,338	NA	6.28E-04	NA	6.28E-04
Aromatics > nC16 to nC21 (TX1006)	---	---	---	8,338	NA	1.75E-04	NA	1.75E-04
TPH-DRO	2,312	NA	2.33E-06	50,025	NA	9.90E+00	NA	9.90E+00
Aliphatics > nC21 to nC35 (TX1006)	---	---	---	373	NA	3.92E-01	NA	3.92E-01
Aromatics > nC21 to nC35 (TX1006)	---	---	---	4,477	NA	1.09E-05	NA	1.09E-05
TPH-ORO	2,844	NA	7.25E-08	4,850	NA	3.92E-01	NA	3.92E-01
TPH Total Risk		NA	2.81E-03		NA	1.04E+01	NA	1.04E+01
CUMULATIVE RISK		4.31E-08	5.26E-03		NA	1.04E+01	4.31E-08	1.04E+01

Notes:
NA: Not available
---: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic
ORO: Oil range organic
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter

Table 4E-10(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 3E: Retained Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
1,2,4-Trimethylbenzene	---	---	---	---	---	---	---	2,500	NA	NA	NA	2.35E-04	NA	2.35E-04
Acetone	57	NA	1.97E-07	NA	2.08E-07	NA	4.89E-07	540	NA	NA	NA	3.43E-07	NA	1.24E-06
Benzene	704	1.02E-10	8.18E-05	1.13E-10	9.09E-05	5.77E-10	8.19E-04	---	---	---	---	---	7.92E-10	9.92E-04
Ethylbenzene	185	NA	6.46E-07	NA	6.60E-07	NA	5.78E-07	1,245	NA	2.04E-02	NA	8.34E-07	NA	2.04E-02
Isopropylbenzene	28	NA	9.76E-08	NA	1.08E-07	NA	6.79E-07	---	---	---	---	---	NA	8.85E-07
Methylene chloride	33	1.23E-12	1.92E-07	1.37E-12	2.13E-07	2.06E-12	1.02E-07	---	---	---	---	---	4.66E-12	5.07E-07
Methyl tert-butyl ether	134	2.21E-12	5.45E-08	2.45E-12	6.05E-08	8.50E-13	1.98E-07	---	---	---	---	---	5.51E-12	3.13E-07
m,p-Xylene	---	---	---	---	---	---	---	5,300	NA	4.69E-03	NA	7.76E-06	NA	4.70E-03
Naphthalene	20	NA	3.49E-07	NA	3.87E-07	NA	2.03E-06	930	NA	NA	NA	6.79E-05	NA	7.06E-05
n-Butylbenzene	72	NA	2.08E-06	NA	6.93E-07	NA	7.57E-07	---	---	---	---	---	NA	3.53E-06
n-Propylbenzene	115	NA	4.01E-05	NA	4.46E-05	NA	2.11E-06	380	NA	NA	NA	2.26E-06	NA	8.90E-05
sec-Butylbenzene	32	NA	9.15E-07	NA	3.05E-07	NA	4.49E-07	---	---	---	---	---	NA	1.67E-06
Toluene	377	NA	6.56E-08	NA	7.29E-07	NA	4.14E-06	---	---	---	---	---	NA	4.93E-06
Xylenes, Total	362	NA	6.31E-08	NA	6.45E-08	NA	1.44E-06	---	---	---	---	---	NA	1.57E-06
Organics Total Risk		**1.05E-10**	**1.27E-04**	**1.17E-10**	**1.39E-04**	**5.80E-10**	**8.32E-04**		**NA**	**2.51E-02**	**NA**	**3.14E-04**	**8.02E-10**	**2.65E-02**
Aliphatics > nC6 to nC8 (TX1006)	---	---	---	---	---	---	---	4,917	NA	NA	NA	2.54E-05	NA	2.54E-05
Aliphatics > nC8 to nC10 (TX1006)	---	---	---	---	---	---	---	4,917	NA	NA	NA	7.47E-04	NA	7.47E-04
Aromatics > nC8 to nC10 (TX1006)	---	---	---	---	---	---	---	19,667	NA	NA	NA	1.18E-04	NA	1.18E-04
TPH-GRO	**274,550**	**NA**	**NA**	**NA**	**1.25E-03**	**NA**	**1.62E-03**	**29,500**	**NA**	**NA**	**NA**	**8.90E-04**	**NA**	**3.76E-03**
Aliphatics > nC10 to nC12 (TX1006)	---	---	---	---	---	---	---	8,338	NA	NA	NA	1.90E-03	NA	1.90E-03
Aliphatics > nC12 to nC16 (TX1006)	---	---	---	---	---	---	---	8,338	NA	NA	NA	8.22E-03	NA	8.22E-03
Aliphatics > nC16 to nC21 (TX1006)	---	---	---	---	---	---	---	8,338	NA	NA	NA	7.75E-02	NA	7.75E-02
Aromatics > nC10 to nC12 (TX1006)	---	---	---	---	---	---	---	8,338	NA	NA	NA	2.28E-05	NA	2.28E-05
Aromatics > nC12 to nC16 (TX1006)	---	---	---	---	---	---	---	8,338	NA	NA	NA	1.58E-05	NA	1.58E-05
Aromatics > nC16 to nC21 (TX1006)	---	---	---	---	---	---	---	8,338	NA	NA	NA	1.19E-05	NA	1.19E-05
TPH-DRO	**2,312**	**NA**	**5.10E-06**	**NA**	**1.55E-05**	**NA**	**4.44E-06**	**50,025**	**NA**	**NA**	**NA**	**8.76E-02**	**NA**	**8.77E-02**
Aliphatics > nC21 to nC35 (TX1006)	---	---	---	---	---	---	---	373	NA	NA	NA	3.47E-03	NA	3.47E-03
Aromatics > nC21 to nC35 (TX1006)	---	---	---	---	---	---	---	4,477	NA	NA	NA	3.56E-06	NA	3.56E-06
TPH-ORO	**2,844**	**NA**	**7.25E-06**	**NA**	**1.86E-05**	**NA**	**5.87E-07**	**4,850**	**NA**	**NA**	**NA**	**3.47E-03**	**NA**	**3.50E-03**
TPH Total Risk		**NA**	**1.23E-05**	**NA**	**1.28E-03**	**NA**	**1.62E-03**		**NA**	**NA**	**NA**	**9.20E-02**	**NA**	**9.49E-02**
CUMULATIVE RISK		**1.05E-10**	**1.39E-04**	**1.17E-10**	**1.42E-03**	**5.80E-10**	**2.45E-03**		**NA**	**2.51E-02**	**NA**	**9.23E-02**	**8.02E-10**	**1.21E-01**

Notes:
NA: Not available
---: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic
ORO: Oil range organic
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter

Table 4F-10(a)

Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker

Sub-area 3F: Retained Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc. (ug/kg)	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
		IELCR	HQ		IELCR	HQ		
TPH-GRO	---	---	---	500	NA	2.86E-03	NA	2.86E-03
TPH-DRO	---	---	---	514	NA	9.57E-02	NA	9.57E-02
TPH-ORO	---	---	---	1,543	NA	7.62E-01	NA	7.62E-01
TPH Total Risk		**NA**	**NA**		**NA**	**8.61E-01**	**NA**	**8.61E-01**
CUMULATIVE RISK		**NA**	**NA**		**NA**	**8.61E-01**	**NA**	**8.61E-01**

Notes:

NA: Not available

---: Risk evaluation was not performed.

HI: Hazard index

TPH: Total petroleum hydrocarbon

DRO: Diesel range organic

GRO: Gasoline range organic

ORO: Oil range organic

ug/kg: Micrograms per kilogram

ug/L: Micrograms per liter

Table 4F-10(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 3F: Retained Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
TPH-GRO	—	—	—	—	—	—	—	500	NA	NA	NA	2.74E-05	NA	2.74E-05
TPH-DRO	—	—	—	—	—	—	—	514	NA	NA	NA	9.07E-04	NA	9.07E-04
TPH-ORO	—	—	—	—	—	—	—	1,543	NA	NA	NA	7.22E-03	NA	7.22E-03
TPH Total Risk		NA	NA	NA	NA	NA	NA		NA	NA	NA	**8.16E-03**	NA	**8.16E-03**
CUMULATIVE RISK		NA	NA	NA	NA	NA	NA		NA	NA	NA	**8.16E-03**	NA	**8.16E-03**

Notes:
NA: Not available
—: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic
ORO: Oil range organic
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter

Table 4G-10(a)

Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker

Sub-area 3G: Retained Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ		IELCR	HQ		
1,2,4-Trimethylbenzene	840	NA	2.72E-06	5.5	NA	3.55E-05	NA	3.82E-05
1,3,5-Trimethylbenzene	326	NA	6.74E-06	---	---	---	NA	6.74E-06
Acetone	820	NA	5.35E-07	---	---	---	NA	5.35E-07
Benzene	548	1.93E-09	1.10E-04	484	5.82E-08	5.82E-03	6.02E-08	5.93E-03
Ethylbenzene	1,010	NA	2.48E-07	---	---	---	NA	2.48E-07
m,p-Xylene	2,650	NA	2.51E-06	---	---	---	NA	2.51E-06
Methyl tert-butyl ether	378	6.57E-12	6.11E-08	---	---	---	6.57E-12	6.11E-08
Naphthalene	478	NA	3.69E-07	---	---	---	NA	3.69E-07
o-Xylene	1,490	NA	1.51E-08	---	---	---	NA	1.51E-08
p-Isopropyltoluene	416	NA	6.09E-08	---	---	---	NA	6.09E-08
Toluene	5,700	NA	6.84E-06	---	---	---	NA	6.84E-06
Xylenes, Total	3,550	NA	9.79E-07	---	---	---	NA	9.79E-07
Organics Total Risk		**1.94E-09**	**1.31E-04**		**5.82E-08**	**5.86E-03**	**6.02E-08**	**5.99E-03**
Aliphatics > nC6 to nC8 (TX1006)	---	---	---	1,680	NA	9.22E-04	NA	9.22E-04
Aliphatics > nC8 to nC10 (TX1006)	---	---	---	1,680	NA	2.71E-02	NA	2.71E-02
Aromatics > nC8 to nC10 (TX1006)	---	---	---	1,680	NA	8.17E-04	NA	8.17E-04
TPH-GRO	**3,280**	**NA**	**1.94E-06**	**5,040**	**NA**	**2.88E-02**	**NA**	**2.88E-02**
Aliphatics > nC10 to nC12 (TX1006)	---	---	---	222	NA	5.38E-03	NA	5.38E-03
Aliphatics > nC12 to nC16 (TX1006)	---	---	---	889	NA	9.32E-02	NA	9.32E-02
Aliphatics > nC16 to nC21 (TX1006)	---	---	---	222	NA	2.20E-01	NA	2.20E-01
Aromatics > nC10 to nC12 (TX1006)	---	---	---	222	NA	3.17E-05	NA	3.17E-05
Aromatics > nC12 to nC16 (TX1006)	---	---	---	222	NA	1.21E-05	NA	1.21E-05
Aromatics > nC16 to nC21 (TX1006)	---	---	---	222	NA	3.12E-06	NA	3.12E-06
TPH-DRO	**85,750**	**NA**	**5.00E-06**	**2,000**	**NA**	**3.18E-01**	**NA**	**3.18E-01**
Aliphatics > nC21 to nC35 (TX1006)	---	---	---	2,432	NA	2.40E+00	NA	2.40E+00
Aromatics > nC21 to nC35 (TX1006)	---	---	---	608	NA	9.59E-07	NA	9.59E-07
TPH-ORO	**1,470,000**	**NA**	**2.17E-06**	**3,040**	**NA**	**2.40E+00**	**NA**	**2.40E+00**
TPH Total Risk		**NA**	**9.11E-06**		**NA**	**2.75E+00**	**NA**	**2.75E+00**
CUMULATIVE RISK		**NA**	**1.40E-04**		**5.82E-08**	**2.76E+00**	**6.02E-08**	**2.76E+00**

Notes:

NA: Not available

---: Risk evaluation was not performed.

HI: Hazard index

TPH: Total petroleum hydrocarbon

DRO: Diesel range organic

GRO: Gasoline range organic

ORO: Oil range organic

ug/kg: Micrograms per kilogram

ug/L: Micrograms per liter

Table 4G-10(b)

Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker

Sub-area 3G: Retained Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
1,2,4-Trimethylbenzene	840	NA	5.86E-06	NA	6.51E-06	NA	1.24E-04	5.5	NA	NA	NA	5.23E-07	NA	1.37E-04
1,3,5-Trimethylbenzene	326	NA	2.28E-06	NA	2.53E-06	NA	1.22E-04	---	---	---	---	---	NA	1.26E-04
Acetone	820	NA	2.86E-06	NA	3.02E-06	NA	7.10E-06	---	---	---	---	---	NA	1.30E-05
Benzene	548	7.91E-11	6.37E-05	8.79E-11	7.07E-05	4.49E-10	6.38E-04	484	9.32E-08	7.50E-02	3.81E-11	5.41E-05	9.38E-08	7.58E-02
Ethylbenzene	1,010	NA	3.52E-06	NA	3.60E-06	NA	3.15E-06	---	---	---	---	---	NA	1.03E-05
m,p-Xylene	2,650	NA	1.54E-06	NA	5.13E-07	NA	2.50E-05	---	---	---	---	---	NA	2.71E-05
Methyl tert-butyl ether	378	6.21E-12	1.53E-07	6.90E-12	1.70E-07	2.39E-12	5.56E-07	---	---	---	---	---	1.55E-11	8.79E-07
Naphthalene	478	NA	8.33E-06	NA	9.25E-06	NA	4.86E-05	---	---	---	---	---	NA	6.61E-05
o-Xylene	1,490	NA	8.66E-07	NA	2.89E-07	NA	1.46E-06	---	---	---	---	---	NA	2.61E-06
p-Isopropyltoluene	416	NA	4.84E-06	NA	1.61E-06	NA	1.84E-06	---	---	---	---	---	NA	8.30E-06
Toluene	5,700	NA	9.94E-07	NA	1.10E-05	NA	6.26E-05	---	---	---	---	---	NA	7.47E-05
Xylenes, Total	3,550	NA	6.19E-07	NA	6.33E-07	NA	1.41E-05	---	---	---	---	---	NA	1.54E-05
Organics Total Risk		**8.53E-11**	**9.55E-05**	**9.48E-11**	**1.10E-04**	**4.51E-10**	**1.05E-03**		**9.32E-08**	**7.50E-02**	**3.81E-11**	**5.46E-05**	**9.38E-08**	**7.63E-02**
Aliphatics > nC6 to nC8 (TX1006)	---	---	---	---	---	---	---	1,680	NA	NA	NA	8.75E-06	NA	8.75E-06
Aliphatics > nC8 to nC10 (TX1006)	---	---	---	---	---	---	---	1,680	NA	NA	NA	2.57E-04	NA	2.57E-04
Aromatics > nC8 to nC10 (TX1006)	---	---	---	---	---	---	---	1,680	NA	NA	NA	1.01E-05	NA	1.01E-05
TPH-GRO	**3,280**	**NA**	**NA**	**NA**	**1.49E-05**	**NA**	**1.93E-05**	**5,040**	**NA**	**NA**	**NA**	**2.76E-04**	**NA**	**3.10E-04**
Aliphatics > nC10 to nC12 (TX1006)	---	---	---	---	---	---	---	222	NA	NA	NA	5.10E-05	NA	5.10E-05
Aliphatics > nC12 to nC16 (TX1006)	---	---	---	---	---	---	---	889	NA	NA	NA	8.83E-04	NA	8.83E-04
Aliphatics > nC16 to nC21 (TX1006)	---	---	---	---	---	---	---	222	NA	NA	NA	2.08E-03	NA	2.08E-03
Aromatics > nC10 to nC12 (TX1006)	---	---	---	---	---	---	---	222	NA	NA	NA	6.18E-07	NA	6.18E-07
Aromatics > nC12 to nC16 (TX1006)	---	---	---	---	---	---	---	222	NA	NA	NA	4.32E-07	NA	4.32E-07
Aromatics > nC16 to nC21 (TX1006)	---	---	---	---	---	---	---	222	NA	NA	NA	3.44E-07	NA	3.44E-07
TPH-DRO	**85,750**	**NA**	**1.89E-04**	**NA**	**5.75E-04**	**NA**	**1.65E-04**	**2,000**	**NA**	**NA**	**NA**	**3.02E-03**	**NA**	**3.94E-03**
Aliphatics > nC21 to nC35 (TX1006)	---	---	---	---	---	---	---	2,432	NA	NA	NA	2.28E-02	NA	2.28E-02
Aromatics > nC21 to nC35 (TX1006)	---	---	---	---	---	---	---	608	NA	NA	NA	7.99E-07	NA	7.99E-07
TPH-ORO	**1,470,000**	**NA**	**3.75E-03**	**NA**	**9.64E-03**	**NA**	**3.04E-04**	**3,040**	**NA**	**NA**	**NA**	**2.28E-02**	**NA**	**3.64E-02**
TPH Total Risk		**NA**	**3.93E-03**	**NA**	**1.02E-02**	**NA**	**4.87E-04**		**NA**	**NA**	**NA**	**2.61E-02**	**NA**	**4.07E-02**
CUMULATIVE RISK		**8.53E-11**	**4.03E-03**	**9.48E-11**	**1.03E-02**	**4.51E-10**	**1.54E-03**		**9.32E-08**	**7.50E-02**	**3.81E-11**	**2.61E-02**	**9.38E-08**	**1.17E-01**

Notes:

NA: Not available

---: Risk evaluation was not performed.

HI: Hazard index

TPH: Total petroleum hydrocarbon

DRO: Diesel range organic

GRO: Gasoline range organic

ORO: Oil range organic

ug/kg: Micrograms per kilogram

ug/L: Micrograms per liter

Table 4H-10(a)

Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker

Sub-area 3H: Retained Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc. (ug/kg)	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
		IELCR	HQ		IELCR	HQ		
TPH-GRO	---	---	---	275	NA	6.42E-04	NA	6.42E-04
TPH-DRO	---	---	---	2,520	NA	5.74E-01	NA	5.74E-01
TPH-ORO	---	---	---	213	NA	1.29E-01	NA	1.29E-01
TPH Total Risk		NA	NA		NA	7.04E-01	NA	7.04E-01
Arsenic	---	---	---	80	NA	NA	NA	NA
Manganese	---	---	---	8,860	NA	NA	NA	NA
Metals Total Risk		NA	NA		NA	NA	NA	NA
CUMULATIVE RISK		NA	NA		NA	7.04E-01	NA	7.04E-01

Notes:

NA: Not available

---: Risk evaluation was not performed.

HI: Hazard index

TPH: Total petroleum hydrocarbon

DRO: Diesel range organic

GRO: Gasoline range organic

ORO: Oil range organic

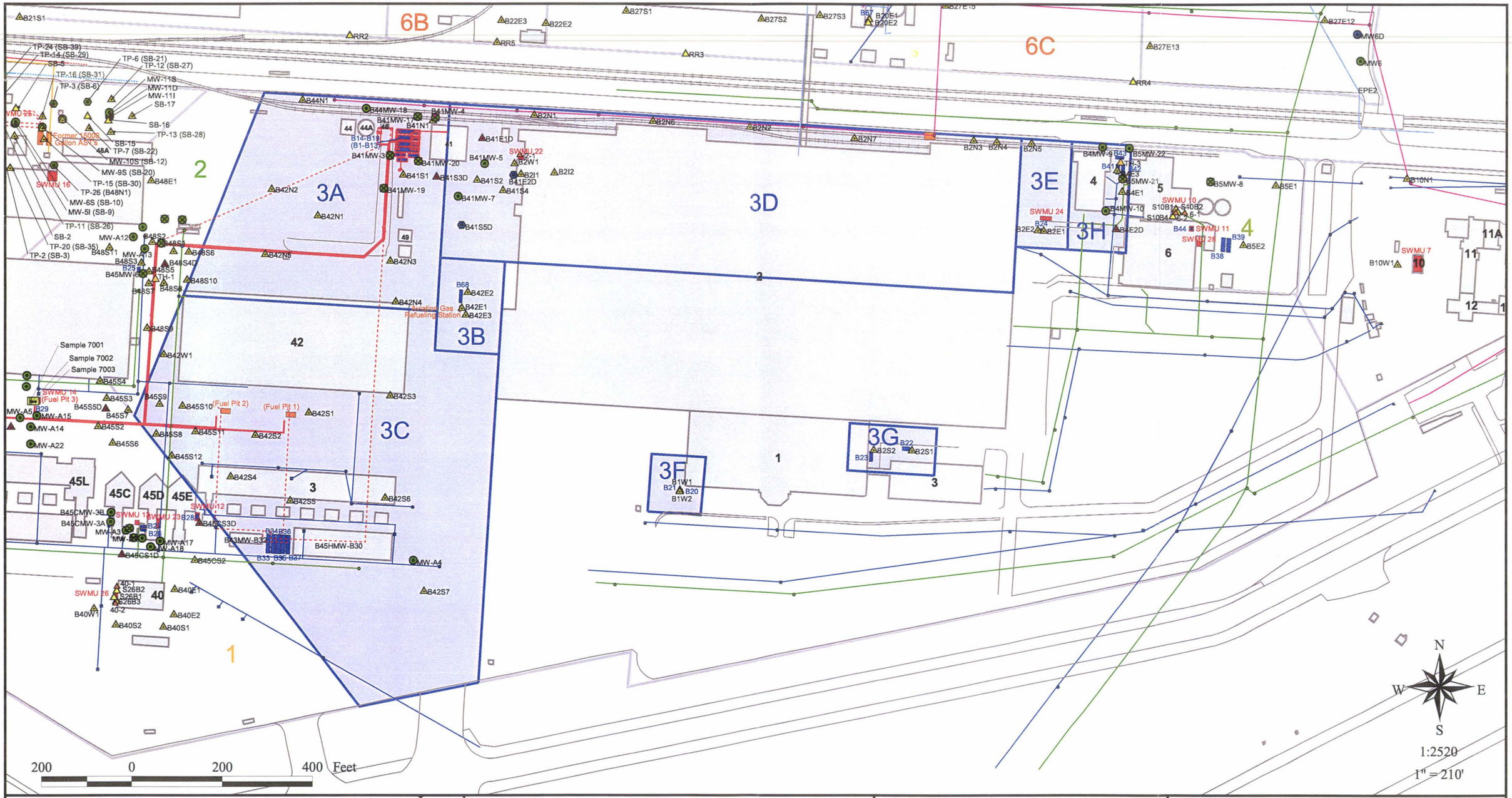
ug/kg: Micrograms per kilogram

ug/L: Micrograms per liter

Table 4H-10(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 3H: Retained Area, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
Acetone	21	NA	7.32E-08	NA	7.73E-08	NA	1.82E-07	—	—	—	—	—	NA	3.32E-07
Methyl ethyl ketone (MEK)	8.8	NA	5.11E-09	NA	5.68E-09	NA	1.98E-08	—	—	—	—	—	NA	3.06E-08
Methylene chloride	4.5	1.68E-13	2.62E-08	1.87E-13	2.91E-08	2.80E-13	1.39E-08	—	—	—	—	—	6.35E-13	6.91E-08
Xylenes, total	6.0	NA	1.04E-09	NA	1.06E-09	NA	2.37E-08	—	—	—	—	—	NA	2.58E-08
Organics Total Risk		**1.68E-13**	**1.06E-07**	**1.87E-13**	**1.13E-07**	**2.80E-13**	**2.39E-07**		**NA**	**NA**	**NA**	**NA**	**6.35E-13**	**4.58E-07**
TPH-GRO	375	NA	NA	NA	1.70E-06	NA	2.21E-06	275	NA	NA	NA	4.98E-06	NA	8.90E-06
TPH-DRO	36,120	NA	7.97E-05	NA	2.42E-04	NA	6.93E-05	2,520	NA	NA	NA	4.41E-03	NA	4.81E-03
TPH-ORO	3,159	NA	8.05E-06	NA	2.07E-05	NA	6.52E-07	213	NA	NA	NA	9.89E-04	NA	1.02E-03
TPH Total Risk		**NA**	**8.77E-05**	**NA**	**2.65E-04**	**NA**	**7.22E-05**		**NA**	**NA**	**NA**	**5.41E-03**	**NA**	**5.83E-03**
Arsenic	—	—	—	—	—	—	—	80	NA	NA	NA	NA	NA	NA
Manganese	—	—	—	—	—	—	—	8,860	NA	NA	NA	NA	NA	NA
Metals Total Risk		**NA**	**NA**	**NA**	**NA**	**NA**	**NA**		**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
CUMULATIVE RISK		**1.68E-13**	**8.78E-05**	**1.87E-13**	**2.65E-04**	**2.80E-13**	**7.24E-05**		**NA**	**NA**	**NA**	**5.41E-03**	**6.35E-13**	**5.83E-03**

Notes:
NA: Not available
—: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic
ORO: Oil range organic
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter



Legend

- Abandoned Shallow Piezometer
- Abandoned Shallow Well
- Deep Piezometer
- Deep Well
- Intermediate Well
- Other Shallow Boring
- RFA Boring
- RCRA Closure Shallow Boring
- RFI Deep Boring/Temp. Piezometer
- RFI Shallow Boring
- RFI Shallow Boring/Temp. Piezometer
- Shallow Piezometer
- Shallow Well
- UST Closure Sample
- Other Area
- UST
- SWMU
- Industrial Sewer Line
- Sanitary Sewer Line
- Steam Line
- Storm Sewer Line
- Jet Fuel Line
- Natural Gas Line
- Water Line
- Abandoned Fuel Line
- Manhole (Type by Color)
- Storm Sewer Intake
- Storm Sewer Outlet

Drawn by: BSM Approved by:

Checked by: Date: September 10, 2003

Risk Assessment & Management Group, Inc.

Figure 4-1
Exposure Area 3:
Sub Areas: 3A, 3B, 3C, 3D, 3E, 3F, 3G, & 3H
Retained Area,
Boeing Tract 1 South

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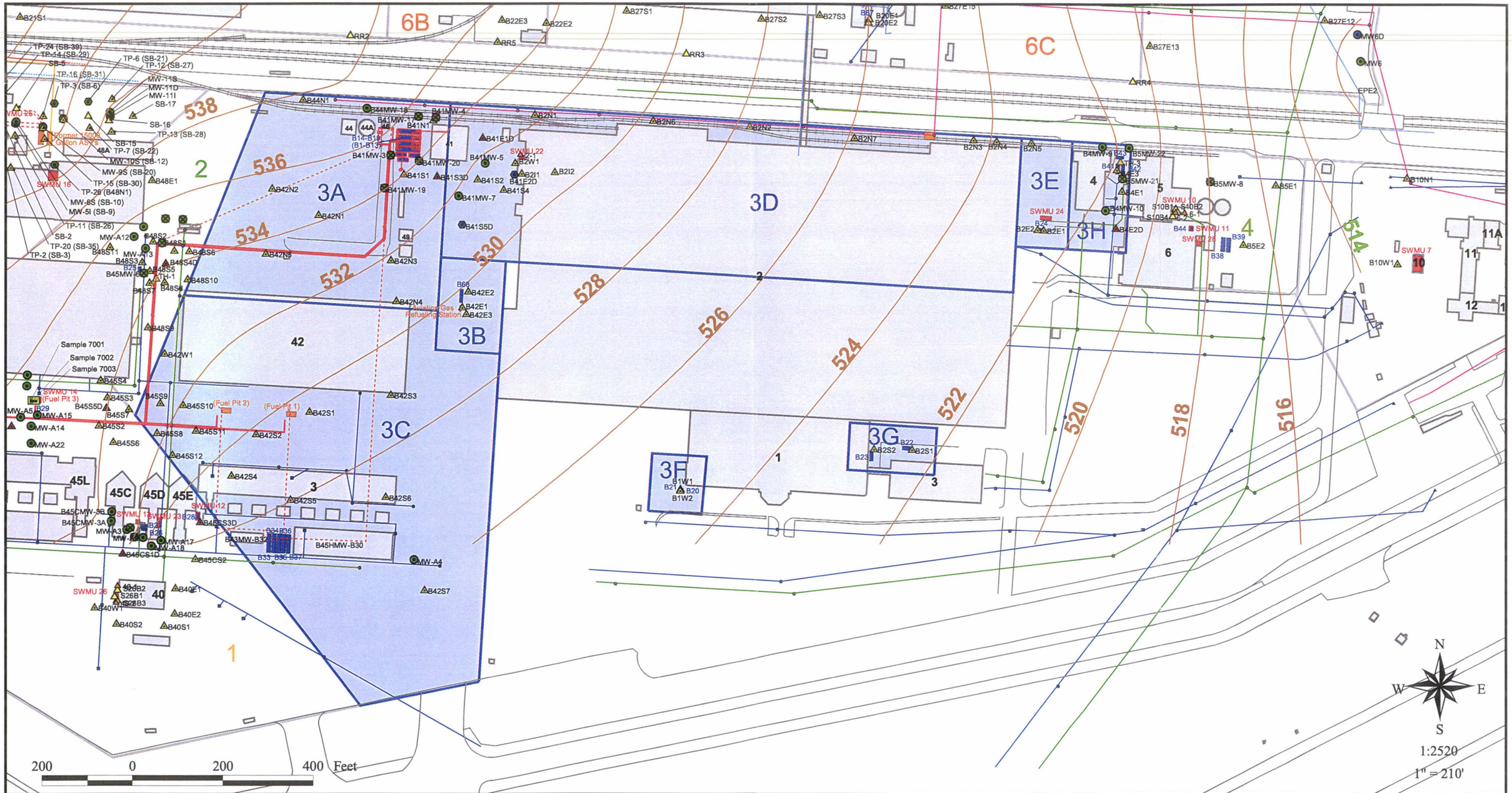

Legend

- Abandoned Shallow Piezometer
- Abandoned Shallow Well
- Deep Piezometer
- Deep Well
- Intermediate Well
- Other Shallow Boring
- RFA Boring
- RCRA Closure Shallow Boring
- RFI Deep Boring/Temp. Piezometer
- RFI Shallow Boring
- RFI Shallow Boring/Temp. Piezometer
- Shallow Piezometer
- Shallow Well
- UST Closure Sample
- Other Area
- UST
- SWMU
- Industrial Sewer Line
- Sanitary Sewer Line
- Steam Line
- Storm Sewer Line
- Jet Fuel Line
- Shallow Groundwater Isopleth
- Natural Gas Line
- Water Line
- Abandoned Fuel Line
- Manhole (Type by Color)
- Storm Sewer Intake
- Storm Sewer Outlet

Drawn by: BSM Approved by:

Checked by: Date: September 10, 2003

Risk Assessment & Management Group, Inc.

Figure 4-2
Shallow Groundwater Isopleth Map for Area 3: Retained Area, Boeing Tract 1 South

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ATTACHMENT 4-A

ECOLOGICAL RISK ASSESSMENT – AREA 3 RETAINED AREA
TIER 1 SCREENING CHECKLIST FOR POTENTIAL RECEPTORS AND HABITAT
CHECKLIST #1

1. Is the site less than ½ mile to a surface water resource (pond, river, lake, etc.)?

   Yes, the adjacent Area 9 to the east is located above a portion of Coldwater Creek that flows through an enclosed culvert. However, Area 3 is up cross gradient about 550 feet southwest from the portion of Coldwater Creek that enters an open culvert and continues to flow north.

2. Are wetlands (e.g. marshes, swamps, fens) on or adjacent to the site?

   No.

3. Are contaminated soils uncovered or otherwise accessible to ecological receptors and the elements?

   No, the site is entirely paved.

4. Has a process (operational) discharge or storm water permit not been issued for the site?

   Site-wide, there is a storm water permit.

5. Is the site located in a known Karst environment (see Reference map)?

   No.

6. Are there federal or state rare, threatened, or endangered species on or within a ½ mile radius of the site? Note, the ½ mile radius limit does not necessarily apply to situations where a hydrogeological connection exists between the site and karsitic features.

   No.

7. Are there one or more environmentally sensitive areas (see Ecological Risk Assessment Figure #1 for definition) at or within a ½ mile radius of the site?

   No.

8. Are commercially or recreationally important species (fauna or flora) on or within a ½ mile radius of the site?

   No.

ATTACHMENT 4-B

ECOLOGICAL RISK ASSESSMENT – AREA 3 RETAINED AREA TIER 1 SCREENING CHECKLIST FOR POTENTIAL RECEPTORS AND HABITAT CHECKLIST #2

1a. Can contaminants associated with the site leach, dissolve, or otherwise migrate to groundwater?

Yes, groundwater has been impacted.

1b. Are contaminants associated with the site mobile in groundwater?

Yes.

1c. Does groundwater from the site discharge into to ecological receptor habitat?

Yes, Coldwater Creek is located to the east below a portion of the adjacent Area 9 in an enclosed culvert, and flows north into an open culvert about 550 feet northeast of Area 3.

1. Could contaminants associated with the site reach ecological receptors via groundwater?

No, groundwater impact is minimal, and located primarily about 700 feet from the creek; therefore, impact to the creek from Area 3 is unlikely.

2a. Is NAPL present at the site?

No.

2b. Is NAPL migrating?

No.

2c. Could NAPL discharge occur where ecological receptors are found?

No.

2. Could contaminants from the site reach ecological receptors via migration of NAPL?

No.

3a. Are contaminants present in surface soils?

No.

3b. Can contaminants be leached from or be transported by erosion of surface soils?

No.

3. Could contaminants reach ecological receptors via erosional transport of contaminated soil or via precipitation runoff?

No.

4a. Are contaminants present in surface soil or on the surface of the ground?

No.

4b. Are potential ecological receptors on the site?

No.

4. Could contaminants reach ecological receptors via direct contact?

No.

5a. Are contaminants present on the site volatile?

Yes.

5b. Could contaminants on the site be transported in air as dust or particulate matter?

No, the site is entirely paved, and the impact is not in the surficial soil.

5. Could contaminants reach ecological receptors via inhalation of volatilized contaminants or contaminants adhered to dust in ambient air or in subsurface burrows?

No, the site is entirely paved, and the impact is not in the surficial soil.

6a. Are contaminants present in surface and shallow subsurface soils or on the surface of the ground?

Yes.

6b. Are contaminants found in soil on the site taken up by plants growing on the site?

No, the site is entirely paved.

6c. Do potential ecological receptors on or near the site feed on plants found on the site?

No, the site is entirely paved.

6d. Do contaminants found on the site bioaccumulate?

Yes, some metals.

6. Could contaminants reach ecological receptors via ingestion of either soil, plants, animals, or contaminants directly?

No.

7a. Are there Karsitic features on or within a ½ mile radius of the site?

No.

7b. Is there a hydrogeological connection between the site and karsitic features such as seeps, springs, streams, or other surface water bodies?

No.

7. Could contaminants reach ecological receptors via transport through a Karst system?

No.

Section
5.0

5.1 INTRODUCTION

The Power Plant, also referred to as Area 4, is located in the southeastern portion of the Facility, adjacent and south of Norfolk and Western Railroad Company railroad tracks and Banshee Road. Area 4 is bounded by Area 3 on the west and south, and by Area 9 on the east (see Figure 5-1). This section describes the constituents in this Area, the exposure model, the evaluation of the current and future risk to human health and the environment, and conclusions based on the results of the risk evaluation.

5.2 DESCRIPTION OF AREA

The Power Plant is an area approximately 400 feet long by 300 feet wide. Within this Area, there are two main buildings and a parking lot.

5.2.1 Potential Sources within Area

The following three SWMUs were identified in this Area during the RFA investigation (SAIC, 1995):

- SWMU 10: Current 375-gallon Waste Oil AST;
- SWMU 11: Former 1,000-gallon Waste Oil UST; and
- SWMU 28: Leaking Transformer.

Three USTs (see Table 5-1) has been identified in this Area, ranging in size from 1,000 gallons to 20,000 gallons. The contents of the USTs have been fuel oil and waste oil. The 20,000-gallon fuel oil UST (B39) is the only UST currently active in this Area.

Hence, within this Area, we anticipate constituents of concern to be petroleum hydrocarbons, metals, and PCBs.

5.2.2 Soil Stratigraphy within Area

There are five soil borings within this Area, see Table 5-2 for further details of these borings. Based on the soil boring logs, the soil stratigraphy within this Area is clay, silty clay, and clayey silt from approximately 2 feet bgs to 24 feet bgs. For additional details, refer to the RFI (MACTEC, 2004). No borings deeper than 24 feet were advanced in this Area. Based on borings outside this Area, bedrock is at approximately 80 feet bgs (which consists of limestone). No karst features have been identified in this Area. To evaluate the risk to indoor inhalation, a source average depth of 3 feet (91 cm) was used (See Table 1-9).

5.2.3 Hydrogeology within Area

There are no monitoring wells located within this Area. Based on recent (since 2000) groundwater gauging data in monitoring wells outside this Area, groundwater flow within the shallow zone is to the east (see Figure 5-2) towards Coldwater Creek, which is located about 175 feet east of this Area below the surface in an enclosed culvert. Based on the soil boring logs,

shallow groundwater appears to be present at about 9 feet bgs. To evaluate the risk to indoor inhalation, an average depth to groundwater of 9 feet (365 cm) was used (See Table 1-13).

5.3 LAND USE

5.3.1 Current Land Use

The Area is owned by Boeing and is being used as a power plant. Building 5 has a basement with 18-foot ceilings. Boeing intends to retain ownership of this Area.

5.3.2 Future Land Use

This Area is anticipated to remain in use as a power plant. When and if the power plant is decommissioned, the future land use could change and risk could be re-evaluated at that point in time.

5.4 AVAILABLE DATA

The following provides an overview of the available data within the Area:

- Five soil borings have been sampled within this Area since 1998 resulting in seven individual soil samples.
- Two soil borings were completed as piezometers in this Area and have been sampled for groundwater up to two times for selected constituents during July 2003.
- Due to the lack of data in Area 4, it was decided to incorporate data from six additional sample locations from Area 3H that are located along the eastern boundary of Area 3H adjacent to Area 4. The additional samples were obtained in November 2002 and July 2003 from the following locations:
    - Soil – B4E1-14, B4E2D-10, and B4E3-18
    - Groundwater – B4E1W, B4E3W and duplicate, and B5MW-22W

5.5 CONSTITUENTS IDENTIFIED WITHIN AREA

5.5.1 Soil

Since 1998 to date, seven soil samples have been collected within Area 4 during two investigations. Also, three samples collected in November 2002 and July 2003 from Area 3H along the boundary with Area 4 were used. These were B4E1-14, B4E2D-10, B4E3-18. These samples have been analyzed for a comprehensive list of constituents that included VOCs, SVOCs, PAHs, PCBs, TPH, and metals. Typical laboratory methods that were used include SW 846 Methods 6010, 7060, 7421, 7471, 7740, 8081, 8240, 8260, 8270, 8310, OA1, and OA2. Appendix E-1 includes a comprehensive table of the laboratory data for constituents detected at least once in soil samples from Area 4. The Area 3H samples are included in Appendix D-1. Table 5-3 presents a listing of the soil samples used in the risk calculations. Evaluation of the data on Tables 5-4(a), 5-4(b), 5-4(c), and 5-4(d) indicated that the following 29 constituents were detected in at least one soil sample:

METALS		ORGANICS	
Arsenic	Lead	Acetone	Benzo(g,h,i)perylene
Barium	Mercury	Methylene chloride	Benzo(k)fluoranthene
Beryllium	Nickel	Methyl ethyl ketone	Chrysene
Cadmium	Selenium	Toluene	Dibenzo(a,h)anthracene
Chromium	Zinc	Xylenes, total	Fluoranthene
Copper		Anthracene	Indeno(1,2,3-cd)pyrene
		Benzo(a)anthracene	Phenanthrene
		Benzo(a)pyrene	Pyrene
		Benzo(b)fluoranthene	TPH

The soil data was further evaluated for potential exposures to the non-residential worker and construction worker.

Non-residential Worker

The non-residential worker data are constituents in soil samples collected above the groundwater table. The data for soil samples collected at or above a depth of 9 feet bgs are included.

The maximum detected concentrations of metals were compared with the background levels. Metals whose maximum concentrations did not exceed the background levels were eliminated from further consideration and included barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, and zinc. Based on this elimination, the following 18 constituents were considered further:

METALS	ORGANICS	
Arsenic	Acetone	Benzo(g,h,i)perylene
Selenium	Methylene chloride	Benzo(k)fluoranthene
	Methyl ethyl ketone	Chrysene
	Toluene	Dibenzo(a,h)anthracene
	Anthracene	Fluoranthene
	Benzo(a)anthracene	Indeno(1,2,3-cd)pyrene
	Benzo(a)pyrene	Phenanthrene
	Benzo(b)fluoranthene	Pyrene

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for soil exposures to the non-residential worker. .

Construction Worker

The construction worker data are constituents in soil samples collected above the typical construction depth. To be conservative, soil samples collected at or above a depth of 20 feet bgs are included.

The maximum detected concentrations of metals were compared with the background levels. Metals whose maximum concentrations did not exceed the background levels were eliminated from further consideration and included barium, beryllium, cadmium, chromium, copper, lead,

mercury, nickel, and zinc. Based on this elimination, the following 20 constituents were considered further:

METALS	ORGANICS	
Arsenic	Acetone	Benzo(g,h,i)perylene
Selenium	Methylene cloride	Benzo(k)fluoranthene
	Methyl ethyl ketone	Chrysene
	Toluene	Dibenzo(a,h)anthracene
	Xylenes, total	Fluoranthene
	Anthracene	Indeno(1,2,3-cd)pyrene
	Benzo(a)anthracene	Phenanthrene
	Benzo(a)pyrene	Pyrene
	Benzo(b)fluoranthene	TPH

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for soil exposures to the construction worker.

5.5.2 Groundwater

During the various investigations conducted within this Area, groundwater samples were analyzed for a comprehensive list of constituents that included VOCs, SVOCs including PAHs, PCBs, TPH, and metals using laboratory analysis SW 846 Methods 6010, 7470, 8081, 8260, 8270, OA1, and OA2. Appendix E-2 includes a comprehensive list of the analytical data for constituents detected at least once in groundwater samples for Area 4. Five additional samples including one duplicate collected in November 2002 and July 2003 from Area 3H along the boundary with Area 4 were used. Appendix D-2 provides comprehensive data for the Area 3H samples B4E1W, B4E3W, and B5MW-22W. Table 5-5 presents a listing of the groundwater samples used in the risk calculations.

Evaluation of the data on Tables 5-6(a), 5-6(b), 5-6(c), and 5-6(d) indicated that the following 29 constituents were detected in at least one groundwater sample:

METALS	ORGANICS/TPH	
Arsenic	1,2-Dichlorobenzene	Carbazole
Barium	Acetone	Chrysene
Chromium	Carbon Disulfide	Dibenzofuran
Copper	Methylene Chloride	Diethylphthalate
Lead	Naphthalene	Di-n-butylphthalate
Manganese	Toluene	Fluoranthene
Mercury	Acenaphthene	Fluorene
Nickel	Anthracene	Phenanthrene
Zinc	Benzo(a)anthracene	Pyrene
	Benzo(b)fluoranthene	TPH(2 types)

Acetone was not considered further since it was the only VOC detected in the specific sample. The maximum detected concentration for each constituent was compared with various screening

criteria. Constituents for which the screening criteria exceeded the maximum detected concentration were eliminated from further consideration. These included 1,2-dichlorobenzene, carbon disulfide, methylene chloride, naphthalene, toluene, acenaphthene, anthracene, chrysene, dibenzofuran, diethylphthalate, di-n-butylphthalate, fluoranthene, fluorene, phenanthrene, pyrene, barium, chromium, copper, mercury, nickel, and zinc. As discussed in Section 1.9.11, lead was also eliminated. The remaining six constituents are presented in the table below:

METALS	ORGANICS/TPH	
Arsenic	Benzo(a)anthracene	Carbazole
Manganese	Benzo(b)fluoranthene	TPH (2 types)

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for groundwater.

5.6 FREE PRODUCT

No free product has been observed within this Area.

5.7 EXPOSURE MODEL

5.7.1 Current Conditions

This Area is comprised of the power plant buildings and parking lots. Hence, the receptors under current conditions would be the non-residential worker and a visitor/maintenance worker to the Area. As the exposure duration for the visitor/maintenance worker is small relative to the on-site non-residential worker, the risk from any soil or groundwater impact will not be quantitatively evaluated for the visitor/maintenance worker.

Exhibit 5-1 presents the EM for the current non-residential worker.

EXHIBIT 5-1. EM FOR CURRENT ON-SITE NON-RESIDENTIAL WORKER

Scenario, Receptor, and Pathways / Routes Analyzed	C or NC	Justification
Dermal Contact with Surficial Soil	NC	The Area is entirely paved; therefore, contact with surficial soil is unlikely.
Ingestion of Surficial Soil	NC	The Area is entirely paved; therefore, ingestion of surficial soil is unlikely.
Indoor Inhalation of Vapors from Subsurface Soil	**C**	**Volatile constituents were detected in soils in this Area; therefore, this pathway is complete.**
Indoor Inhalation of Vapors from Groundwater	**C**	**Vapors from groundwater may migrate into the buildings; hence, this pathway is complete.**

Notes: **NC:** Not Complete **C:** Complete

Exposure pathways highlighted in bold indicate that these pathways are complete and will be quantitatively evaluated.

5.7.2 Future Conditions

Under future conditions, the land use in this Area is not expected to alter; hence, the receptors will remain the same in the future. As such, they will not be quantitatively evaluated, as the comparison for the current conditions will be protective of the future non-residential worker. Groundwater concentrations are expected to decrease in the future through natural attenuation processes, further reducing the risk.

In the future, construction work could be performed within this Area; therefore, the potential future construction worker is a receptor. Exhibit 5-2 presents the EM for the construction worker.

EXHIBIT 5-2. EM FOR POTENTIAL FUTURE CONSTRUCTION WORKER

Scenario, Receptor, and Pathways/Routes Analyzed	C or NC	Justification
Dermal Contact with Soil	**C**	**Soil is impacted at depths less than 20 feet, which is considered the construction zone; therefore, contact is possible.**
Accidental Ingestion of Soil	**C**	**Soil is impacted at depths less than 20 feet, which is considered the construction zone; therefore, ingestion is possible.**
Outdoor Inhalation of Vapors and Particulates from Soil	**C**	**Soil is impacted within this Area, and some of the constituents identified are volatile; therefore, this pathway is complete.**
Dermal Contact with Groundwater	**C**	**A construction worker may come in contact with groundwater located at a depth of about 12 feet bgs. Therefore, this pathway is considered complete.**
Outdoor Inhalation of Vapors from Groundwater	**C**	**Vapors from groundwater may migrate upwards through the unsaturated zone and into the ambient air. Hence, this pathway is complete.**

Notes: NC: Not Complete C: Complete

Exposure pathways highlighted in bold indicate that these pathways are complete and will be quantitatively evaluated.

5.8 REPRESENTATIVE CONCENTRATIONS

Representative concentrations for this Area were determined to be the Area-wide average in soil and groundwater. This was chosen as the sampling activities that have been performed have all been within the areas of most impact; therefore, the mean concentration represents a conservative estimate of the overall impact to the Area. Additionally, no information is known regarding the

likely future location of a building; therefore, it is prudent to identify the source areas as the representative concentration.

Tables 5-7(a), 5-7(b), and 5-8 present the soil and groundwater average and maximum concentrations. The ratio of the maximum detected concentration to average concentration is also presented. None of the constituents exceeded a ratio of 10.

5.9 CALCULATION OF RISK

Tables 5-9(a) and 5-9(b) present the results for the non-residential worker and construction worker, respectively. The tables present the carcinogenic (IELCR) and non-carcinogenic (HQ and HI) risks for:

- Each COC,
- Each route of exposure,
- Cumulative risk for each COC,
- Cumulative risk for each route of exposure, and
- Total risk, which is the sum of risk for all the COCs and all the routes of exposures.

Based on these tables, following are the key observations.

5.9.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 5-9(a), the cumulative IELCR is 2.17×10^{-10}, which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 5-9(a) the cumulative HI for all COCs and all routes of exposure is 0.47, which is below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

5.9.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 5-9(b), the cumulative IELCR is 2.6×10^{-6} that is below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 5-9(b), the cumulative HI is 0.014, which is below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

5.10 ECOLOGICAL RISK

The only potential ecological receptor in the area is Coldwater Creek. Area 4 is located approximately 175 feet west of the portion of Coldwater Creek that flows through an enclosed culvert, and about 200 feet southwest of the portion of Coldwater Creek that enters an open culvert and continues to flow north. There are no known unpermitted conduits present that could carry impacts from Area 4 to Coldwater Creek. Considering the geology, groundwater flow characteristics, and the chemical types and concentrations of impacts in Area 4, it is not likely that migration of impacts from Area 4 to Coldwater Creek will occur. The Tier 1 ecological screening checklists have been completed for this Area, and are presented as Attachment 5-A and Attachment 5-B. These checklists identified no potential ecological receptors or issues.

5.11 CONCLUSIONS

The calculated risks for all the COCs and all potentially complete routes of exposure for the non-residential worker and the construction worker are below the acceptable target risks.

Table 5-1
Summary of Underground Storage Tanks (USTs) Present Historically within Area 4: Power Plant
Boeing Tract 1, St. Louis, Missouri

UST No.	Location	Volume (Gallons)	Contents	Construction Material	Year Installed	Status	Comments
B38	Bldg. 6 (Boeing)	20,000	Fuel Oil	Coated Double Wall Steel	1989	Closed	In Place
B39	Bldg. 6 (Boeing)	20,000	Fuel Oil	Coated Double Wall Steel	1989	Active	
B44	Bldg. 6 (Boeing)	1,000	Waste Oil	Single Wall Steel	1970	Removed 1988	Excavated

Table 5-2
Soil Boring Information for Area 4: Power Plant
Boeing Tract 1, St. Louis, Missouri

Boring	Date Drilled
B5E1	7/24/2003
B5E2	7/24/2003
S10B1	2/3/1998
S10B2	2/3/1998
S10B4	2/3/1998

Table 5-3
Soil Samples Used in Average Concentration Calculations in Area 4: Power Plant
Boeing Tract 1, St. Louis, Missouri

	Volatile Organic Compounds		Total Petroleum Hydrocarbons		Polynuclear Aromatic Hydrocarbons		Polychlorinated Biphenyls		Metals	
	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker
4	B5E1-6	B5E1-6		B4E1-14	S10B1 4-5	S10B1 4-5			B5E1-6	B5E1-6
	B5E2-6	B5E2-6		B4E2D-10	S10B1 6-7	S10B1 6-7			B5E2-6	B5E2-6
		B4E1-14		B4E3-18	S10B2 3-5	S10B2 3-5			S10B1 4-5	S10B1 4-5
		B4E3-18			S10B2 5-6	S10B2 5-6			S10B1 6-7	S10B1 6-7
					S10B4 3-5	S10B4 3-5			S10B2 3-5	S10B2 3-5
									S10B2 5-6	S10B2 5-6
									S10B4 3-5	S10B4 3-5
										B4E3-18

Table 5-4(a)
Soil Constituents Average Concentrations for VOCs in
Area 4: Power Plant
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)				
	ACETONE	METHYL ETHYL KETONE (MEK)	METHYLENE CHLORIDE	TOLUENE	XYLENES, TOTAL
Non- Residential Worker					
B5E1-6	10	2.5	2.5	3.1	2.5
B5E2-6	36	7.6	2.8	2.5	2.5
S10B1 4-5	16	NA	NA	NA	3.1
S10B2 3-5	51	NA	NA	NA	3.1
S10B2 5-6	31	NA	NA	NA	3.25
S10B4 3-5	140	NA	NA	NA	3.2
Average Concentration - Only Samples With VOC Detections	**23**	**5.05**	**2.65**	**2.8**	
Construction Worker					
B5E1-6	10	2.5	2.5	3.1	2.5
B5E2-6	36	7.6	2.8	2.5	2.5
S10B1 4-5	16	NA	NA	NA	3.1
S10B2 3-5	51	NA	NA	NA	3.1
S10B2 5-6	31	NA	NA	NA	3.25
S10B4 3-5	140	NA	NA	NA	3.2
B4E1-14	NA	NA	NA	12.5	9.4
B4E3-18	21	8.8	4.5	1.75	2.5
Average Concentration - Only Samples With VOC Detections	**22.33**	**6.3**	**3.27**	**4.96**	**4.23**

Notes:

ug/kg - micrograms per kilogram

Groundwater table is at a depth of 9 feet below ground surface (bgs) for area.

Non Residential Worker - above groundwater table in the area

Construction Worker - above a depth of 20 feet bgs

VOCs - Volatile Organic Compounds

NA - Not Analyzed

No VOCs except acetone detected in the sample

Table 5-4(b)
Soil Constituents Average Concentrations for TPHs in
Area 4: Power Plant Construction Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B4E1-14	B4E2D-10	B4E3-18	Overall Area Average (ug/kg)
TPH - DRO				**TPH - DRO**
11/21/2002	**47,000**	NA	NA	
11/22/2002	NA	**55,000**	NA	
7/24/2003	NA	NA	**6,360**	
AVERAGE TPH - DRO	47,000	55,000	6,360	36,120
TPH - GRO				**TPH - GRO**
11/22/2002	NA	250	NA	
7/24/2003	NA	NA	500	
AVERAGE TPH - GRO		250	500	375
TPH - ORO				**TPH - ORO**
7/24/2003	NA	NA	3,159	
AVERAGE TPH - ORO			3,159	3,159

Notes:

Groundwater table is at a depth of 9 feet below ground surface (bgs) for area.

Non Residential Worker - above groundwater table in the area

Construction Worker - above a depth of 20 feet bgs

ug/kg - micrograms per kilogram

TPH - Total petroleum hydrocarbon

DRO - Diesel range organic

GRO - Gasoline range organic

ORO - Oil range organic

Bold indicates a detection

NA - Not analyzed

Table 5-4(c)
Soil Constituents Average Concentrations for Metals in Area 4: Power Plant Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)										
	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COPPER	LEAD	MERCURY	NICKEL	SELENIUM	ZINC
B5E1-6	1,500	179,000	511	423	10,100	13,000	6,350	50	9,650	2,350	33,300
B5E2-6	NA	NA	NA	NA	NA	NA	8,480	NA	NA	NA	NA
S10B1 4-5	7,400	97,000	NA	310	15,000	NA	12,000	10	NA	780	NA
S10B1 6-7	11,000	93,000	NA	315	15,000	NA	14,000	150	NA	960	NA
S10B2 3-5	12,000	150,000	NA	305	20,000	NA	14,000	30	NA	1,000	NA
S10B2 5-6	10,000	130,000	NA	325	17,000	NA	18,000	30	NA	880	NA
S10B4 3-5	3,150	290,000	NA	315	15,000	NA	19,000	15	NA	1,600	NA
Average Concentration - Only Samples With Metals Detections	**7,508**	**156,500**	**511**	**332.2**	**15,350**	**13,000**	**13,119**	**48**	**9,650**	**1,262**	**33,300**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 9 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 5-4(c)
Soil Constituents Average Concentrations for Metals in Area 4: Power Plant Construction Worker
Boeing Tract 1; St. Louis, Missouri

Sample ID	Metals (ug/kg)										
	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COPPER	LEAD	MERCURY	NICKEL	SELENIUM	ZINC
B5E1-6	1,500	179,000	511	423	10,100	13,000	6,350	50	9,650	2,350	33,300
B5E2-6	NA	NA	NA	NA	NA	NA	8,480	NA	NA	NA	NA
S10B1 4-5	7,400	97,000	NA	310	15,000	NA	12,000	10	NA	780	NA
S10B1 6-7	11,000	93,000	NA	315	15,000	NA	14,000	150	NA	960	NA
S10B2 3-5	12,000	150,000	NA	305	20,000	NA	14,000	30	NA	1,000	NA
S10B2 5-6	10,000	130,000	NA	325	17,000	NA	18,000	30	NA	880	NA
S10B4 3-5	3,150	290,000	NA	315	15,000	NA	19,000	15	NA	1,600	NA
B4E3-18	NA	NA	NA	NA	NA	NA	8,630	NA	NA	NA	NA
Average Concentration - Only Samples With Metals Detections	**7,508**	**156,500**	**511**	**332**	**15,350**	**13,000**	**12,558**	**48**	**9,650**	**1,262**	**33,300**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 9 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 5-4(d)
Soil Constituents Average Concentrations for PAHs in Area 4: Power Plant
Non-Residential Worker and Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	PAH (ug/kg)											
	ANTHRACENE	BENZO(A)ANTHRACENE	BENZO(A)PYRENE	BENZO(B)FLUORANTHENE	BENZO(GHI)PERYLENE	BENZO(K)FLUORANTHENE	CHRYSENE	DIBENZO(A,H)ANTHRACENE	FLUORANTHENE	INDENO(1,2,3-CD)PYRENE	PHENANTHRENE	PYRENE
S10B1 4-5	2.075	2.075	4.43	5.03	7.79	2.075	4.35	10.8	5.46	2.075	10.6	11.6
S10B1 6-7	2.135	2.135	2.135	5.02	2.135	2.135	6.36	2.135	15.6	7.26	8.29	14.3
S10B2 3-5	2.075	2.075	6.27	8.02	9.98	2.075	4.63	30.7	14.1	2.075	15.9	17.2
S10B2 5-6	2.155	2.155	15.4	8.42	29.9	5.46	6.35	84.2	16.3	15.8	30.2	16.2
S10B4 3-5	6.46	17	9.31	115	17.5	2.125	13.9	46.5	2.125	2.125	56.7	43.4
Average Concentration - Only Samples With PAH Detections	**2.98**	**5.09**	**7.51**	**28.30**	**13.46**	**2.77**	**7.12**	**34.87**	**10.72**	**5.87**	**24.34**	**20.54**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 9 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
PAH - Polynuclear aromatic hydrocarbon
NA - Not Analyzed

Table 5-5
Groundwater Samples Used in Average Concentration Calculations in Area 4: Power Plant
Boeing Tract 1, St. Louis, Missouri

	Volatile Organic Compounds	Total Petroleum Hydrocarbons	Polynuclear Aromatic Hydrocarbons	Polychlorinated Biphenyls	Metals
4	B5E2W	B5E1W	B5E1W		B5E1W
	B4E3W	B5E2W	B5E2W		B5E2W
	B5MW-22W	B4E1W	B5MW-22W		B4E3W
		B4E3W			B5MW-22W
		B5MW-22W			

Table 5-6(a)
Groundwater Constituents Average Concentrations
for VOCs in Area 4: Power Plant
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)					
	1,2-DICHLOROBENZENE	ACETONE	CARBON DISULFIDE	METHYLENE CHLORIDE	NAPHTHALENE	TOLUENE
B5E1W	4.03	7.8	5	10	5.278	2.5
B5E2W	5.80	10	5	10	4.6	2.5
B4E3W	2.5	10	2.1	10	5	2.35
B5MW-22W	3.2	17.5	5	3.9	4.25	2.5
Average Concentration - Only Samples With VOC Detections	**3.8**		**4.0**	**8.0**	**4.6**	**2.5**

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed
No VOCs except acetone detected in the sample

Table 5-6(b)
Groundwater Constituents Average Concentrations
for TPHs in Area 4: Power Plant
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B5E1W	B5E2W	B4E1W	B4E3W	B5MW-22W	Overall Area Average (ug/l)
TPH-DRO						TPH-DRO
11/21/2002	NA	NA	**3,500**	NA	NA	
11/22/2002	NA	NA	NA	NA	NA	
6/27/2003	NA	NA	NA	NA	**520**	
7/24/2003	NA	**611**	NA	**3,540**	NA	
7/29/2003	**244**	NA	NA	NA	NA	
AVERAGE	244	611	3,500	3,540	520	1,683
TPH-GRO						TPH-GRO
11/22/2002	NA	NA	NA	NA	NA	
6/27/2003	NA	NA	NA	NA	50	
7/24/2003	500	500	NA	500	NA	
AVERAGE	500	500		500	50	387.5
TPH-ORO						TPH-ORO
6/27/2003	NA	NA	NA	NA	50	
7/24/2003	NA	**362**	NA	375	NA	
7/29/2003	166.5	NA	NA	NA	NA	
AVERAGE	166.5	362		375	50	238.375

Notes:
ug/l - micrograms per liter
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 5-6(c)
Groundwater Constituents Average Concentrations for Metals in Area 4: Power Plant
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/l)								
	ARSENIC	BARIUM	CHROMIUM	COPPER	LEAD	MANGANESE	MERCURY	NICKEL	ZINC
B5E1W	15	**70**	2.5	2	22	**867**	0.1	5	**90**
B5E2W	NA	NA	NA	NA	22	NA	NA	NA	NA
B4E3W	NA	NA	NA	NA	22	NA	NA	NA	NA
B5MW-22W	**80**	**1,910**	**14**	**17**	**68**	**8,860**	**0.5**	**23**	**378**
Average Concentration - Only Samples With Metals Detections	**47.50**	**990**	**8.25**	**9.50**	**33.50**	**4,863.5**	**0.30**	**14**	**234**

Notes:
ug/l - micrograms per liter
NA - Not Analyzed
Bold indicates a detection

Table 5-6(d)
Groundwater Constituents Average Concentrations for PAHs in Area 4: Power Plant
Boeing Tract 1, St. Louis, Missouri

Sample ID	PAH (ug/l)												
	ACENAPHTHENE	ANTHRACENE	BENZO(A)ANTHRACENE	BENZO(B)FLUORANTHENE	CARBAZOLE	CHRYSENE	DIBENZOFURAN	DIETHYL PHTHALATE	DI-N-BUTYL PHTHALATE	FLUORANTHENE	FLUORENE	PHENANTHRENE	PYRENE
B5E1W	5.56	5.56	5.56	5.56	5.56	5.56	5.56	**2.70**	5.56	5.56	5.56	5.56	5.56
B5E2W	**3.4**	**5**	**5.7**	**5.3**	**8.3**	**6.7**	**2.2**	**2.9**	**4.6**	**18**	**3.8**	**18**	**12**
B5MW-22W	**7.8**	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26
Average Concentration - Only Samples With PAH Detections	**5.59**	**5.27**	**5.51**	**5.37**	**6.37**	**5.84**	**4.34**	**3.62**	**5.14**	**9.61**	**4.87**	**9.61**	**7.61**

Notes:
ug/l - micrograms per liter
PAH - Polynuclear aromatic hydrocarbon
NA - Not Analyzed
Bold indicates a detection

Table 5-7(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Area 4: Power Plant
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Acetone	7	5	6.09	140	23	NA	N/A
Methyl ethyl ketone (MEK)	2	1	1.50	7.6	5.1	NA	N/A
Methylene chloride	2	2	1.06	2.8	2.7	NA	N/A
Toluene	2	1	1.11	3.1	2.8	NA	N/A
Polynuclear Aromatic Hydrocabons (PAHs)							
Anthracene	7	1	2.17	6.5	3.0	NA	N/A
Benzo(a)anthracene	7	1	3.34	17	5.1	NA	N/A
Benzo(a)pyrene	7	4	2.05	15	7.5	NA	N/A
Benzo(b)fluoranthene	7	5	4.06	115	28	NA	N/A
Benzo(ghi)perylene	7	4	2.22	30	13	NA	N/A
Benzo(k)fluoranthene	7	1	1.97	5.5	2.8	NA	N/A
Chrysene	7	5	1.95	14	7.1	NA	N/A
Dibenzo(a,h)anthracene	7	4	2.41	84	35	NA	N/A
Fluoranthene	7	4	1.52	16	11	NA	N/A
Indeno(1,2,3-c,d)pyrene	7	2	2.69	16	5.9	NA	N/A
Phenanthrene	7	5	2.33	57	24	NA	N/A
Pyrene	7	5	2.11	43	21	NA	N/A
Polychlorinated Biphenyls (PCBs)							
None	2	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	2	0	N/A	ND	N/A	NA	N/A
TPH GRO	2	0	N/A	ND	N/A	NA	N/A
TPH ORO	2	0	N/A	ND	N/A	NA	N/A
Total Metals							
Arsenic	6	4	1.60	12,000	7,508	9,200	Y
Barium	6	6	1.85	290,000	156,500	725,000	N
Beryllium	1	1	1.00	511	511	800	N
Cadmium	6	1	1.27	423	332	<1,000	N
Chromium	6	6	1.30	20,000	15,350	58,000	N
Copper	1	1	1.00	13,000	13,000	13,000	N
Lead	7	7	1.45	19,000	13,119	21,800	N
Mercury	6	2	0.63	30	48	39	N
Nickel	1	1	1.00	9,650	9,650	14,000	N
Selenium	6	5	1.27	1,600	1,262	260	Y
Zinc	1	1	1.00	33,300	33,300	49,000	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 5-7(b)
Soil Constituents of Concern Summary for Construction for Area 4: Power Plant
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Acetone	8	6	6.27	140	22	NA	N/A
Methyl ethyl ketone (MEK)	3	2	1.40	8.8	6.3	NA	N/A
Methylene chloride	3	3	1.38	4.5	3.3	NA	N/A
Toluene	4	1	0.63	3.1	5.0	NA	N/A
Xylenes, Total	4	1	0.59	2.5	4.2	NA	N/A
Polynuclear Aromatic Hydrocabons (PAHs)							
Anthracene	7	1	2.17	6.5	3.0	NA	N/A
Benzo(a)anthracene	7	1	3.34	17	5.1	NA	N/A
Benzo(a)pyrene	7	4	2.05	15	7.5	NA	N/A
Benzo(b)fluoranthene	7	5	4.06	115	28	NA	N/A
Benzo(ghi)perylene	7	4	2.22	30	13	NA	N/A
Benzo(k)fluoranthene	7	1	1.97	5.5	2.8	NA	N/A
Chrysene	7	5	1.95	14	7.1	NA	N/A
Dibenzo(a,h)anthracene	7	4	2.41	84	35	NA	N/A
Fluoranthene	7	4	1.52	16	11	NA	N/A
Indeno(1,2,3-c,d)pyrene	7	2	2.69	16	5.9	NA	N/A
Phenanthrene	7	5	2.33	57	24	NA	N/A
Pyrene	7	5	2.11	43	21	NA	N/A
Polychlorinated Biphenyls (PCBs)							
None	2	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	5	3	1.52	55,000	36,120	NA	N/A
TPH GRO	4	0	N/A	ND	375	NA	N/A
TPH ORO	3	0	N/A	ND	3,159	NA	N/A
Total Metals							
Arsenic	6	4	1.60	12,000	7,508	9,200	Y
Barium	6	6	1.85	290,000	156,500	725,000	N
Beryllium	1	1	1.00	511	511	800	N
Cadmium	6	1	1.27	423	332	<1,000	N
Chromium	6	6	1.30	20,000	15,350	58,000	N
Copper	1	1	1.00	13,000	13,000	13,000	N
Lead	8	8	1.51	19,000	12,558	21,800	N
Mercury	6	2	0.63	30	48	39	N
Nickel	1	1	1.00	9,650	9,650	14,000	N
Selenium	6	5	1.27	1,600	1,262	260	Y
Zinc	1	1	1.00	33,300	33,300	49,000	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 5-8
Groundwater Constituents of Concern Summary for Area 4: Power Plant
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
1,2-Dichlorobenzene	6	3	0.97	3.7	3.8	600	N
Carbon Disulfide	4	1	0.53	2.1	4.0	201	N
Methylene chloride	4	1	0.66	5.3	8.0	49.1	N
Naphthalene	4	1	1.00	4.6	4.6	100	N
Toluene	8	1	0.88	2.2	2.5	1,000	N
Polynuclear Aromatic Hydrocabons (PAHs)							
Acenaphthene	3	2	1.40	7.8	5.6	2,000	N
Anthracene	3	1	0.95	5.0	5.3	10,000	N
Benzo(a)anthracene	3	1	1.03	5.7	5.5	0.921	Y
Benzo(b)fluoranthene	3	1	0.99	5.3	5.4	0.921	Y
Carbazole	3	1	1.30	8.3	6.4	7.08	Y
Chrysene	3	1	1.15	6.7	5.8	92.1	N
Dibenzofuran	3	1	0.51	2.2	4.3	5.99	N
Diethylphthalate	3	2	0.80	2.9	3.6	30,000	N
Di-n-butylphthalate	3	1	0.89	4.6	5.1	1,560	N
Fluoranthene	3	1	1.87	18	9.6	626	N
Flourene	3	1	0.78	3.8	4.9	1,000	N
Phenanthrene	3	1	1.87	18	9.6	173	N
Pyrene	3	1	1.58	12	7.6	469	N
Polychlorinated Biphenyls (PCBs)							
None	2	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	6	5	2.10	3,540	1,683	NA	N/A
TPH GRO	5	0	N/A	ND	388	NA	N/A
TPH ORO	4	1	1.52	362	238	NA	N/A
Total Metals							
Arsenic	2	1	1.68	80	48	10	Y
Barium	2	2	1.93	1,910	990	2,000	N
Chromium	2	1	1.70	14	8.3	100	N
Copper	2	1	1.79	17	9.5	1,300	N
Lead	4	1	2.03	68	34	15	Y
Manganese	2	2	1.82	8,860	4,864	50	Y
Mercury	2	1	1.67	0.5	0.3	2	N
Nickel	2	1	1.64	23	14	100	N
Zinc	2	2	1.62	378	234	2,000	N

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 5-9(a)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker
Area 4: Power Plant, Boeing Tract 1, St. Louis, Missouri

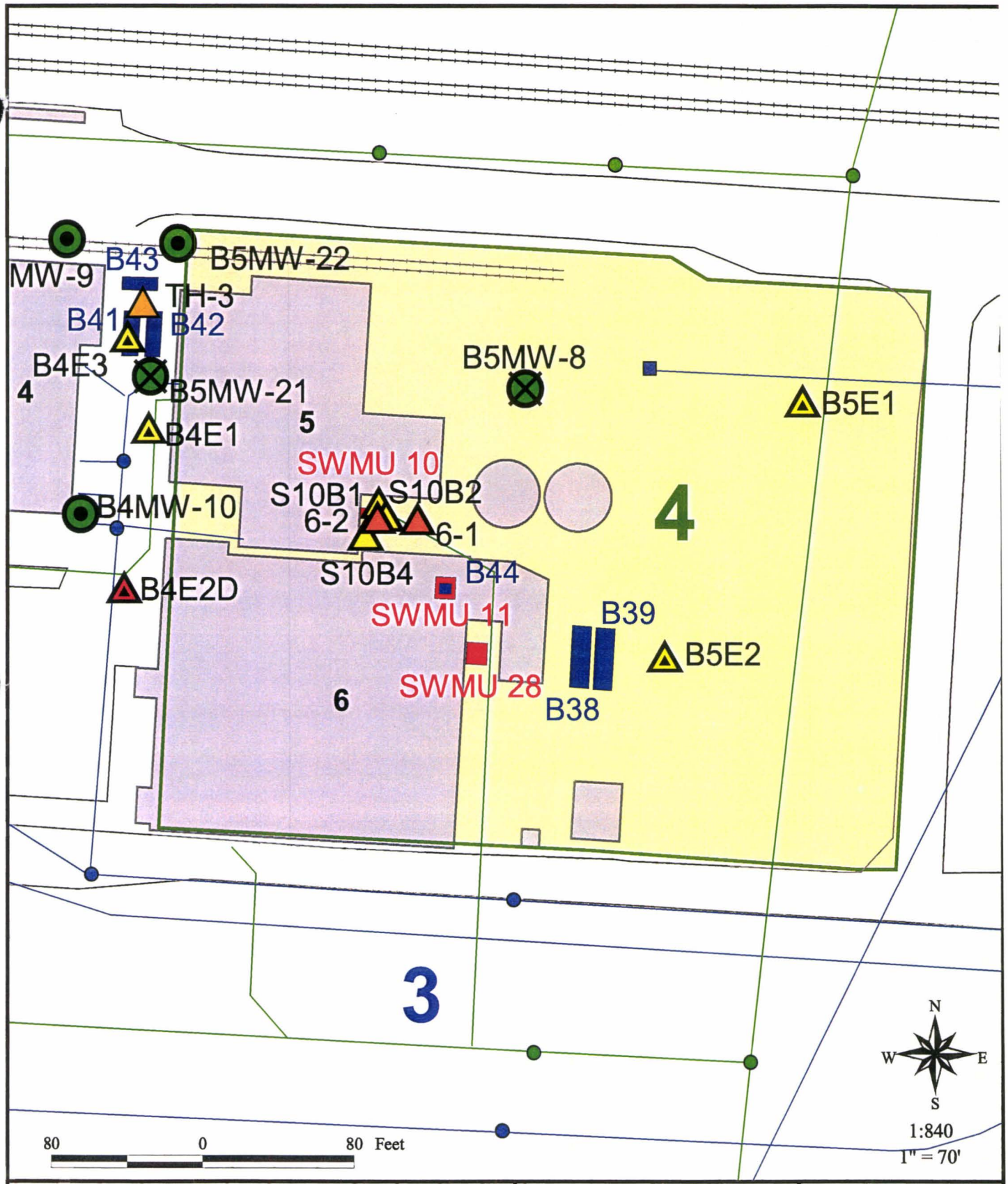
COCs	Average Soil Conc.	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ		IELCR	HQ		
Acetone	23	NA	1.40E-08	—	—	—	NA	1.40E-08
Methyl ethyl ketone (MEK)	5.1	NA	5.96E-10	—	—	—	NA	5.96E-10
Methylene chloride	2.7	8.90E-13	1.76E-09	—	—	—	8.90E-13	1.76E-09
Toluene	2.8	NA	3.15E-09	—	—	—	NA	3.15E-09
Anthrathene	3.0	NA	3.49E-13	—	—	—	NA	3.49E-13
Benzo(a)anthracene	5.1	2.93E-16	NA	5.5	7.98E-11	7.98E-06	7.98E-11	7.98E-06
Benzo(a)pyrene	7.5	1.32E-15	NA	—	—	—	1.32E-15	NA
Benzo(b)fluoranthene	28	9.22E-16	NA	5.4	1.35E-10	1.35E-05	1.35E-10	1.35E-05
Benzo(g,h,i)perylene	13	NA	1.44E-13	—	—	—	NA	1.44E-13
Benzo(k)fluoranthene	2.8	2.98E-18	NA	—	—	—	2.98E-18	NA
Chrysene	7.1	7.13E-18	NA	—	—	—	7.13E-18	NA
Dibenzo(a,h)anthracene	35	1.11E-15	NA	—	—	—	1.11E-15	NA
Fluoranthene	11	NA	1.93E-13	—	—	—	NA	1.93E-13
Indeno(1,2,3-cd)pyrene	5.9	2.29E-17	NA	—	—	—	2.29E-17	NA
Phenanthrene	24	NA	1.43E-11	—	—	—	NA	1.43E-11
Pyrene	21	NA	5.04E-13	—	—	—	NA	5.04E-13
Carbazole	—	—	—	6.4	1.78E-12	1.78E-07	1.78E-12	1.78E-07
Organics Total Risk		**8.93E-13**	**1.96E-08**		**2.16E-10**	**2.16E-05**	**2.17E-10**	**2.17E-05**
TPH-GRO	—	—	—	388	NA	2.41E-03	NA	2.41E-03
TPH-DRO	—	—	—	1,683	NA	3.40E-01	NA	3.40E-01
TPH-ORO	—	—	—	238	NA	1.28E-01	NA	1.28E-01
TPH Total Risk		**NA**	**NA**		**NA**	**4.70E-01**	**NA**	**4.70E-01**
Arsenic	7,508	NA	NA	48	NA	NA	NA	NA
Manganese	—	—	—	4,864	NA	NA	NA	NA
Selenium	1,262	NA	NA	—	—	—	NA	NA
Metals Total Risk		**NA**	**NA**		**NA**	**NA**	**NA**	**NA**
CUMULATIVE RISK		**8.93E-13**	**1.96E-08**		**2.16E-10**	**4.70E-01**	**2.17E-10**	**4.70E-01**

Notes:
NA: Not available
—: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
GRO: Gasoline range organic
DRO: Diesel range organic
ORO: Oil range organic
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter

Table 5-9(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Futue Construction Worker
Area 4: Power Plant, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
Acetone	22	NA	7.79E-08	NA	8.22E-08	NA	1.93E-07	—	—	—	—	—	NA	3.53E-07
Methyl ethyl ketone (MEK)	6.3	NA	3.66E-09	NA	4.07E-09	NA	1.42E-08	—	—	—	—	—	NA	2.19E-08
Methylene chloride	3.3	1.22E-13	1.90E-08	1.36E-13	2.11E-08	2.04E-13	1.01E-08	—	—	—	—	—	4.62E-13	5.02E-08
Toluene	5.0	NA	8.65E-10	NA	9.61E-09	NA	5.45E-08	—	—	—	—	—	NA	6.50E-08
Xylenes, total	4.2	NA	1.64E-10	NA	1.37E-09	NA	1.12E-08	—	—	—	—	—	NA	1.28E-08
Anthracene	3.0	NA	3.46E-09	NA	3.85E-09	NA	2.07E-10	—	—	—	—	—	NA	7.52E-09
Benzo(a)anthracene	5.1	8.02E-12	NA	2.06E-11	NA	9.06E-14	NA	5.5	1.03E-06	NA	1.83E-12	NA	1.03E-06	NA
Benzo(a)pyrene	7.5	1.18E-10	NA	2.58E-10	NA	6.92E-13	NA	—	—	—	—	—	3.77E-10	NA
Benzo(b)fluoranthene	28	4.46E-11	NA	1.14E-10	NA	3.84E-13	NA	5.4	1.50E-06	NA	1.78E-12	NA	1.50E-06	NA
Benzo(g,h,i)perylene	13	NA	5.22E-07	NA	1.74E-07	NA	9.17E-10	—	—	—	—	—	NA	6.96E-07
Benzo(k)fluoranthene	2.8	4.37E-13	NA	1.12E-12	NA	2.24E-15	NA	—	—	—	—	—	1.56E-12	NA
Chrysene	7.1	1.12E-13	NA	2.88E-13	NA	1.66E-15	NA	—	—	—	—	—	4.01E-13	NA
Dibenzo(a,h)anthracene	35	5.49E-10	NA	1.41E-09	NA	1.63E-12	NA	—	—	—	—	—	1.96E-09	NA
Fluoranthene	11	NA	3.11E-08	NA	5.19E-08	NA	8.14E-10	—	—	—	—	—	NA	8.39E-08
Indeno(1,2,3-cd)pyrene	5.9	9.25E-12	NA	2.37E-11	NA	3.00E-14	NA	—	—	—	—	—	3.30E-11	NA
Phenanthrene	24	NA	9.43E-07	NA	3.14E-07	NA	1.20E-08	—	—	—	—	—	NA	1.27E-06
Pyrene	21	NA	7.96E-08	NA	2.65E-07	NA	2.10E-09	—	—	—	—	—	NA	3.47E-07
Carbazole	—	—	—	—	—	—	—	6.4	NA	NA	4.30E-14	NA	4.30E-14	NA
Organics Total Risk		**7.30E-10**	**1.68E-06**	**1.83E-09**	**9.28E-07**	**3.04E-12**	**2.99E-07**		**2.53E-06**	**NA**	**3.66E-12**	**NA**	**2.54E-06**	**2.91E-06**
TPH-GRO	375	NA	NA	NA	1.70E-06	NA	2.21E-06	388	NA	NA	NA	2.11E-05	NA	2.50E-05
TPH-DRO	36,120	NA	7.97E-05	NA	2.42E-04	NA	6.93E-05	1,683	NA	NA	NA	2.95E-03	NA	3.34E-03
TPH-ORO	3,159	NA	8.05E-06	NA	2.07E-05	NA	6.52E-07	238	NA	NA	NA	1.11E-03	NA	1.14E-03
TPH Total Risk		**NA**	**NA**	**NA**	**NA**	**NA**	**NA**		**NA**	**NA**	**NA**	**4.08E-03**	**NA**	**4.50E-03**
Arsenic	7,508	1.87E-10	2.91E-05	5.92E-08	9.21E-03	9.85E-11	1.53E-06	48	NA	NA	NA	NA	5.95E-08	9.24E-03
Manganese	—	—	—	—	—	—	—	4,864	NA	NA	NA	NA	NA	NA
Selenium	1,262	NA	2.93E-05	NA	9.78E-05	NA	2.70E-05	—	—	—	—	—	NA	1.54E-04
Metals Total Risk		**1.87E-10**	**5.84E-05**	**5.92E-08**	**9.31E-03**	**9.85E-11**	**2.86E-05**		**NA**	**NA**	**NA**	**NA**	**5.95E-08**	**9.40E-03**
CUMULATIVE RISK		**9.17E-10**	**6.01E-05**	**6.11E-08**	**9.31E-03**	**1.02E-10**	**2.89E-05**		**2.53E-06**	**NA**	**3.66E-12**	**4.08E-03**	**2.60E-06**	**1.39E-02**

Notes:
NA: Not available
—: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
GRO: Gasoline range organic
DRO: Diesel range organic
ORO: Oil range organic
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter



Legend

- Other Shallow Boring
- RFI Shallow Boring
- RFI Shallow Boring/Temp. Piezometer
- RFA Boring
- Abandoned Shallow Piezometer
- Abandoned Shallow Well
- RFI Deep Boring/Temp. Piezometer
- Sanitary Sewer Line
- Storm Sewer Line
- Manhole (Type by Color)
- Storm Sewer Intake
- Storm Sewer Outlet
- UST
- SWMU

Drawn by: KLC Approved by:

Checked by: Date: December 5, 2003

Risk Assessment & Management Group, Inc.

Figure 5-1
Exposure Area 4:
Power Plant,
Boeing Tract 1 South

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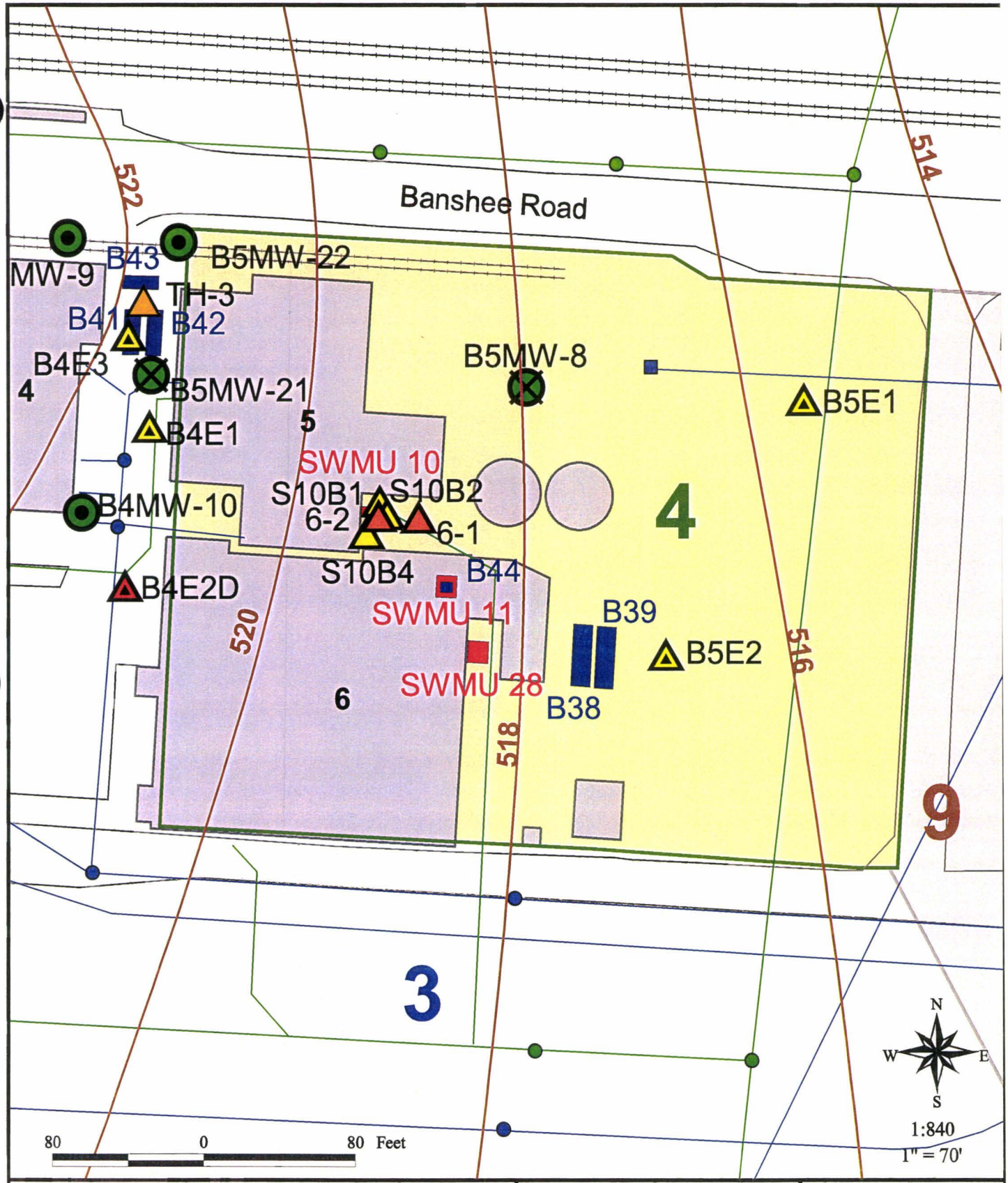

Legend

- Other Shallow Boring
- RFI Shallow Boring
- RFI Shallow Boring/Temp. Piezometer
- RFA Boring
- Abandoned Shallow Piezometer
- Abandoned Shallow Well
- RFI Deep Boring/Temp. Piezometer
- Shallow Groundwater Isopleth
- Sanitary Sewer Line
- Storm Sewer Line
- Manhole (Type by Color)
- Storm Sewer Intake
- Storm Sewer Outlet
- UST
- SWMU

Drawn by: KLC Approved by:

Checked by: Date: December 5, 2003

Risk Assessment & Management Group, Inc.

Figure 5-2
Shallow Groundwater Isopleth Map For Area 4: Power Plant, Boeing Tract 1 South

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ATTACHMENT 5-A

ECOLOGICAL RISK ASSESSMENT – AREA 4 POWER PLANT
TIER 1 SCREENING CHECKLIST FOR POTENTIAL RECEPTORS AND HABITAT
CHECKLIST #1

1. Is the site less than ½ mile to a surface water resource (pond, river, lake, etc.)?

   Yes, Area 4 is located approximately 175 feet west of the portion of Coldwater Creek that flows through an enclosed culvert, and about 200 feet southwest of the portion of Coldwater Creek that enters an open culvert and continues to flow north.

2. Are wetlands (e.g. marshes, swamps, fens) on or adjacent to the site?

   No.

3. Are contaminated soils uncovered or otherwise accessible to ecological receptors and the elements?

   No, the site is entirely paved.

4. Has a process (operational) discharge or storm water permit not been issued for the site?

   Site-wide, there is a storm water permit.

5. Is the site located in a known Karst environment (see Reference map)?

   No.

6. Are there federal or state rare, threatened, or endangered species on or within a ½ mile radius of the site? Note, the ½ mile radius limit does not necessarily apply to situations where a hydrogeological connection exists between the site and karsitic features.

   No.

7. Are there one or more environmentally sensitive areas (see Ecological Risk Assessment Figure #1 for definition) at or within a ½ mile radius of the site?

   No.

8. Are commercially or recreationally important species (fauna or flora) on or within a ½ mile radius of the site?

   No.

ATTACHMENT 5-B

ECOLOGICAL RISK ASSESSMENT – AREA 4 POWER PLANT
TIER 1 SCREENING CHECKLIST FOR POTENTIAL RECEPTORS AND HABITAT
CHECKLIST #2

1a. Can contaminants associated with the site leach, dissolve, or otherwise migrate to groundwater?

Yes, groundwater has been impacted.

1b. Are contaminants associated with the site mobile in groundwater?

Yes.

1c. Does groundwater from the site discharge into to ecological receptor habitat?

Yes, Coldwater Creek is located to the east of Area 4 in an enclosed culvert, and flows north into an open culvert at the north perimeter of the adjacent Area 9.

1. Could contaminants associated with the site reach ecological receptors via groundwater?

No, groundwater impact is minimal, and located primarily about 200 feet from the creek, therefore impact is very unlikely.

2a. Is NAPL present at the site?

No.

2b. Is NAPL migrating?

No.

2c. Could NAPL discharge occur where ecological receptors are found?

No.

2. Could contaminants from the site reach ecological receptors via migration of NAPL?

No.

3a. Are contaminants present in surface soils?

Constituents have been detected in soil samples at depths of 3 feet bgs.

3b. Can contaminants be leached from or be transported by erosion of surface soils?

No, the site is paved.

3. Could contaminants reach ecological receptors via erosional transport of contaminated soil or via precipitation runoff?

No, the site is paved.

4a. Are contaminants present in surface soil or on the surface of the ground?

No.

4b. Are potential ecological receptors on the site?

No.

4. Could contaminants reach ecological receptors via direct contact?

No.

5a. Are contaminants present on the site volatile?

Yes.

5b. Could contaminants on the site be transported in air as dust or particulate matter?

No, the site is entirely paved, and the impact is not in the surficial soil.

5. Could contaminants reach ecological receptors via inhalation of volatilized contaminants or contaminants adhered to dust in ambient air or in subsurface burrows?

No, the site is entirely paved, and the impact is not in the surficial soil.

6a. Are contaminants present in surface and shallow subsurface soils or on the surface of the ground?

Yes, constituents have been detected in soil samples from 3 to 7 feet bgs.

6b. Are contaminants found in soil on the site taken up by plants growing on the site?

No, the site is entirely paved.

6c. Do potential ecological receptors on or near the site feed on plants found on the site?

No, the site is entirely paved.

6d. Do contaminants found on the site bioaccumulate?

Yes, some metals.

6. Could contaminants reach ecological receptors via ingestion of either soil, plants, animals, or contaminants directly?

No.

7a. Are there Karsitic features on or within a ½ mile radius of the site?

No.

7b. Is there a hydrogeological connection between the site and karsitic features such as seeps, springs, streams, or other surface water bodies?

No.

7. Could contaminants reach ecological receptors via transport through a Karst system?

No.

Section
6.0

6.1 INTRODUCTION

The Industrial Water Treatment Plant (IWTP), also referred to as Area 5, is located in the southeastern corner of the site, adjacent and south of Norfolk and Western Railroad Company railroad tracks and Banshee Road. Area 5 is bounded by Area 9 on the west and by the Airport runway on the south and east (see Figure 6-1). This section describes the constituents in this Area, the exposure model, the evaluation of the current and future risk to human health and the environment, and conclusions based on the results of the risk evaluation.

6.2 DESCRIPTION OF AREA

The IWTP is an area approximately 240 feet long by 250 feet wide at its longest dimensions. Within this Area, there is one building, aeration tanks, sludge settling and equalization tanks, a sludge holding tank, filter press, and a parking lot.

6.2.1 Potential Sources within Area

The following two SWMUs were identified in this Area during the RFA investigation (SAIC, 1995):

- SWMU 3: Wastewater Sludge Collection and Holding Tank (120,000-gallon capacity) – listed hazardous waste (F006 & F019 electroplating wastes); and
- SWMU 21: IWTP Sludge Setting and Equalization Tanks S-1, S-2, S-3, S-4, E-1, E-2, and E-3.

Hence, within this Area, we anticipate constituents of concern to be primarily metals.

6.2.2 Soil Stratigraphy within Area

There are seven soil borings within this Area, see Table 6-1 for further details of these borings. Based on the soil boring logs, the soil stratigraphy within this Area is clay from approximately 2 feet below ground surface (bgs) to 28 feet bgs. For additional details, refer to the RFI (MACTEC, 2004). No borings deeper than 28 feet were advanced in this Area. Based on borings outside this Area, bedrock is found in this Area at approximately 80 feet bgs (which consists of limestone). No karst features have been identified in this Area. To evaluate the risk to indoor inhalation, a source average depth of 10 feet (304.8 cm) was used (see Table 1-9).

6.2.3 Hydrogeology within Area

There are no monitoring wells located within this Area. Based on recent (since 2000) groundwater gauging data in monitoring wells outside this Area, groundwater flow within the shallow zone in this Area may be to the west towards Coldwater Creek. Coldwater Creek is located about 300 feet to the west of this Area below the surface in an enclosed culvert; however, no groundwater elevation data is available in this Area to confirm the groundwater flow direction. Based on the soil boring logs, shallow groundwater appears to be present at about 12 to 13 feet bgs. To evaluate the risk to indoor inhalation, an average depth to groundwater of 12 feet (365.76 cm) was used (see Table 1-13).

6.3 LAND USE

6.3.1 Current Land Use

The Area is owned by Boeing and is being used as an IWTP. Boeing intends to retain ownership of this Area.

6.3.2 Future Land Use

This Area is anticipated to remain in use as an IWTP.

6.4 AVAILABLE DATA

The following provides an overview of the available data within the Area:

- One soil boring completed as a piezometer exists in this Area and has been sampled once for groundwater during February 1998.
- Seven soil borings have been sampled during two events in May 1994 and February 1998 within this Area resulting in 15 individual soil samples.

6.5 CONSTITUENTS IDENTIFIED WITHIN AREA

6.5.1 Soil

From 1994 to date, 15 soil samples have been collected within Area 5 during two investigations. These samples have been analyzed for a comprehensive list of constituents that included VOCs, TPH, metals, and cyanide. Typical laboratory methods that were used include SW 846 Methods 6010, 7060, 7421, 7471, 7740, 8240, 9010, OA1, and OA2. Appendix F-1 includes a comprehensive table of the laboratory data for constituents detected at least once in soil samples from Area 5. Table 6-2 presents a listing of soil samples that were used in the risk calculations. Evaluation of the data in Tables 6-3(a), 6-3(b), and 6-3(c) indicated that the following 13 constituents were detected in at least one soil sample:

METALS/INORGANICS		ORGANICS
Arsenic	Nickel	Acetone
Barium	Selenium	TPH (2 types)
Cadmium	Silver	
Chromium	Zinc	
Lead	Cyanide, total	
Mercury		

Acetone was eliminated from further consideration since it was the only VOC detected in the specific sample. Note as discussed in Section 1.9.11, lead was also eliminated. The data was further screened for potential exposures to the non-residential worker and construction worker.

Non-residential Worker

The non-residential worker data are constituents in soil samples collected above the groundwater table. The data for soil samples collected at or above a depth of 12 feet bgs are included.

The maximum detected concentrations of metals were compared with the background levels. Metals whose maximum detected concentrations did not exceed the background levels were eliminated from further consideration and included barium, cadmium, chromium, silver, and zinc. The following six constituents were considered further:

METALS/INORGANICS	TPH
Arsenic	TPH (2 types)
Mercury	
Nickel	
Selenium	
Cyanide, total	

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for soil exposures to the non-residential worker.

Construction Worker

The construction worker data are constituents in soil samples collected above the typical construction depth. To be conservative, soil samples collected at or above a depth of 20 feet bgs are included.

The maximum detected concentrations of metals were compared with the background levels. Metals whose maximum detected concentrations did not exceed the background levels were eliminated from further consideration and included barium, cadmium, chromium, silver, and zinc. The following six constituents were considered further:

METALS/INORGANICS		TPH
Arsenic	Selenium	TPH (2 types)
Mercury	Cyanide, total	
Nickel		

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for soil exposures to the construction worker.

6.5.2 Groundwater

During the various investigations conducted within this Area, groundwater samples were analyzed for a list of constituents that included metals and cyanide using laboratory analysis SW 846 Methods 6010, 7060, 7421, 7470, 7471, 7740, and 9010. Appendix F-2 includes a comprehensive list of the analytical data for constituents detected at least once in groundwater samples from Area 5. Table 6-4 presents a listing of groundwater samples used in the risk

calculations. Evaluation of the data in Table 6-5(a) indicated that five constituents were detected in one groundwater sample:

METALS	
Barium	Mercury
Chromium	Selenium
Lead	

The maximum detected concentration for each constituent was compared with various screening criteria. Constituents for which the screening criteria exceeded the maximum detected concentration were eliminated from further consideration and included barium, mercury, and selenium. Note as discussed in Section 1.9.11, lead was also eliminated. The remaining constituent is shown in the table below:

METALS
Chromium

Based on this evaluation, the constituent listed above was considered for quantitative risk evaluation for groundwater exposure.

6.6 FREE PRODUCT

Free product has not been observed within this Area.

6.7 EXPOSURE MODEL

6.7.1 Current Conditions

This Area is comprised of the IWTP building, aeration tanks, sludge settling and equalization tanks, a sludge holding tank, filter press, and parking lots. Hence, the receptors under current conditions would be the non-residential worker and a visitor/maintenance worker to the Area. As the exposure duration for the visitor/maintenance worker is small relative to the on-site non-residential worker, the risk from any soil or groundwater impact will not be quantitatively evaluated for the visitor/maintenance worker.

Exhibit 6-1 presents the EM for the current non-residential worker.

EXHIBIT 6-1. EM FOR CURRENT ON-SITE NON-RESIDENTIAL WORKER		
Scenario, Receptor, and Pathways / Routes Analyzed	**C or NC**	**Justification**
Dermal Contact with Surficial Soil	NC	The Area is mostly paved and covered with buildings and tanks; therefore, contact with surficial soil is unlikely.
Ingestion of Surficial Soil	NC	The Area is mostly paved and covered with buildings and tanks; therefore, ingestion of surficial soil is unlikely.
Indoor Inhalation of Vapors from Subsurface Soil	C	**Volatile constituents were detected in soils in this Area; therefore, this pathway is complete.**
Indoor Inhalation of Vapors from Groundwater	C	**This pathway is complete; however, there is no data available regarding volatile constituents.**
Notes: NC: Not Complete C: Complete Exposure pathways highlighted in bold indicate that these pathways are complete and will be quantitatively evaluated.		

6.7.2 Future Conditions

Under future conditions, the land use in this Area is not expected to alter; hence, the receptors will remain the same in the future. As such, they will not be quantitatively evaluated, as the comparison for the current conditions will be protective of the future non-residential worker. Groundwater concentrations are expected to decrease in the future through natural attenuation processes, further reducing the risk.

In the future, construction work could be performed within this Area; therefore, the potential future construction worker is a receptor. Exhibit 6-2 presents the EM for the construction worker.

EXHIBIT 6-2. EM FOR POTENTIAL FUTURE CONSTRUCTION WORKER		
Scenario, Receptor, and Pathways/Routes Analyzed	**C or NC**	**Justification**
Dermal Contact with Soil	C	**Soil is impacted at depths less than 20 feet, which is considered the construction zone; therefore, contact is possible.**
Accidental Ingestion of Soil	C	**Soil is impacted at depths less than 20 feet, which is considered the construction zone; therefore, ingestion is possible.**
Outdoor Inhalation of Vapors and Particulates from Soil	C	**Soil is impacted within this Area, and some of the constituents identified are volatile; therefore, this pathway is complete.**
Dermal Contact with Groundwater	C	**A construction worker may come in contact with groundwater located at a depth of about 12 to 13 feet bgs. Therefore, this pathway is considered complete.**
Outdoor Inhalation of Vapors from Groundwater	C	**This pathway is complete; however, there is no data available regarding volatile constituents.**
Notes: NC: Not Complete C: Complete Exposure pathways highlighted in bold indicate that these pathways are complete and will be quantitatively evaluated.		

6.8 REPRESENTATIVE CONCENTRATIONS

Representative concentrations for this Area were determined to be the Area-wide average in soil and groundwater. This was chosen as the sampling activities that have been performed have all been within the areas of most impact; therefore, the mean concentration represents a conservative estimate of the overall impact to the Area. Additionally, no information is known regarding the likely future location of a building; therefore, it is prudent to identify the source areas as the representative concentration.

Tables 6-6(a), 6-6(b), and 6-7 present the soil and groundwater average and maximum concentrations. The ratio of the maximum detected concentration to average concentration is also presented. None of the constituents exceeded a ratio of 10.

6.9 CALCULATION OF RISK

Tables 6-8(a) and 6-8(b) present the results for the non-residential worker and construction worker, respectively. The tables present the carcinogenic (IELCR) and non-carcinogenic (HQ and HI) risks for:

- Each COC,
- Each route of exposure,
- Cumulative risk for each COC,

- Cumulative risk for each route of exposure, and
- Total risk, which is the sum of risk for all the COCs and all the routes of exposures.

Based on these tables, following are the key observations.

6.9.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 6-8(a), the cumulative IELCR for non-residential worker in Area 5 is not available.

Non-carcinogenic Risk:

As shown in Table 6-8(a), the cumulative HI for all COCs and all routes of exposure is 0.00053, which is well below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

6.9.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 6-8(b), the cumulative IELCR is 6.37×10^{-8} that is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 6-8(b), the cumulative HI is 0.013, which is well below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

6.10 ECOLOGICAL RISK

The only potential ecological receptor in the area is Coldwater Creek. Area 5 is located approximately 300 feet east of the portion of Coldwater Creek that flows through an enclosed culvert, and about 400 feet southeast of the portion of Coldwater Creek that enters an open culvert and continues to flow north. There are no known unpermitted conduits present that could carry impacts from Area 5 to Coldwater Creek. Considering the geology, groundwater flow characteristics, and the chemical types and concentrations of the impacts in Area 5, it is not likely that migration of impacts from Area 5 to Coldwater Creek will occur. The Tier 1 ecological screening checklists have been completed for this Area, and are presented as attachment 5-A and Attachment 5-B. These checklists identified no potential ecological receptors or issues.

6.11 CONCLUSIONS

The calculated risks for all the COCs and all potentially complete routes of exposure for the construction worker and the non-residential worker are below the acceptable target risks.

Table 6-1
Soil Boring Information for Area 5: IWTP
Boeing Tract 1, St. Louis, Missouri

Boring	Date Drilled
DB-1	5/25/1994
S21B1	2/2/1998
S21B2	2/2/1998
S21B3	2/2/1998
S21B4	2/2/1998
S21B5	2/2/1998
S21B6	2/2/1998

Table 6-2
Soil Samples Used in Average Concentration Calculations in Area 5: Industrial Water Treatment Plant
Boeing Tract 1, St. Louis, Missouri

	Volatile Organic Compounds		Total Petroleum Hydrocarbons		Polynuclear Aromatic Hydrocarbons		Polychlorinated Biphenyls		Metals	
	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker
5			S21B5 10-12	S21B5 10-12					DB-1 (5.6-6.5)	DB-1 (5.6-6.5)
									S21B1 1-2	DB-1 (13.9-18.5)
									S21B2 1-2	S21B1 1-2
									S21B3 4-5	S21B2 1-2
									S21B4 2-3	S21B2 13-15
									S21B4 7-9	S21B3 17-21
									S21B5 10-12	S21B3 4-5
									S21B5 2-4	S21B4 2-3
									S21B6 10-12	S21B4 7-9
									S21B6 2-4	S21B5 10-12
										S21B5 2-4
										S21B6 10-12
										S21B6 2-4

Note:
- analysis type not performed

Table 6-3(a)
Soil Constituents Average Concentrations VOCs in Area 5: Industrial Water Treatment Plant Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)
	ACETONE
Non- Residential Worker	
S21B5 10-12	19
Average Concentration - Only Samples With VOC Detections	
Construction Worker	
S21B5 10-12	19
Average Concentration - Only Samples With VOC Detections	

Notes:

ug/kg - micrograms per kilogram

Groundwater table is at a depth of 12 feet below ground surface (bgs) for area.

Non Residential Worker - above groundwater table in the area

Construction Worker - above a depth of 20 feet bgs

VOCs - Volatile Organic Compounds

NA - Not Analyzed

No VOCs except acetone detected in the sample

Table 6-3(b)
Soil Constituents Average Concentrations for TPHs in
Area 5: Industrial Water Treatment Plant
Non-Residential Worker and Construction Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	S21B5 10-12	Overall Area Average (ug/l)
TPH - DRO		TPH-DRO
2/2/1998	200,000	
AVERAGE TPH - DRO	200,000	200,000
TPH - GRO		TPH-GRO
2/2/1998	93,000	
AVERAGE TPH - GRO	93,000	93,000
TPH - ORO		TPH-ORO
None		
AVERAGE TPH - ORO		

Notes:
Groundwater table is at a depth of 12 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 6-3(c)
Soil Constituents Average Concentrations for Metals in Area 5: Industrial Water Treatment Plant Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)										
	ARSENIC	BARIUM	CADMIUM	CHROMIUM	CYANIDE, TOTAL	LEAD	MERCURY	NICKEL	SELENIUM	SILVER	ZINC
DB-1 (5.6-6.5)	5,510	94,300	50	18,800	160	8,390	20	15,500	500	450	41,200
S21B1 1-2	13,000	130,000	720	18,000	250	10,000	40	NA	1,200	1,200	NA
S21B2 1-2	3,100	180,000	315	14,000	250	15,000	30	NA	1,500	1,250	NA
S21B3 4-5	8,400	160,000	315	15,000	250	10,000	30	NA	1,400	1,250	NA
S21B4 2-3	7,100	110,000	310	18,000	250	12,000	60	NA	1,000	1,250	NA
S21B4 7-9	3,150	62,000	315	12,000	250	7,000	90	NA	1,600	1,250	NA
S21B5 10-12	11,000	140,000	640	15,000	250	12,000	70	NA	910	1,250	NA
S21B5 2-4	13,000	200,000	310	23,000	250	14,000	220	NA	1,200	1,250	NA
S21B6 10-12	12,000	99,000	325	17,000	250	8,500	30	NA	1,000	1,300	NA
S21B6 2-4	6,000	110,000	295	25,000	250	96,000	60	NA	1,700	1,200	NA
Average Concentration - Only Samples With Metals Detections	8,226	128,530	359.5	17,580	241	19,289	65	15,500	1,201	1,165	41,200

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 12 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 6-3(c)
Soil Constituents Average Concentrations for Metals in Sub-Area 5A: Industrial Water Treament Plant Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals										
	ARSENIC	BARIUM	CADMIUM	CHROMIUM	CYANIDE, TOTAL	LEAD	MERCURY	NICKEL	SELENIUM	SILVER	ZINC
DB-1 (5.6-6.5)	5,510	94,300	50	18,800	160	8,390	20	15,500	500	450	41,200
DB-1 (13.9-18.5)	8,980	90,300	50	18,200	5,420	6,490	95	10,600	500	400	34,900
S21B1 1-2	13,000	130,000	720	18,000	250	10,000	40	NA	1,200	1,200	NA
S21B2 1-2	3,100	180,000	315	14,000	250	15,000	30	NA	1,500	1,250	NA
S21B2 13-15	3,300	120,000	330	15,000	250	10,000	30	NA	1,000	1,300	NA
S21B3 17-21	10,000	160,000	320	16,000	250	16,000	30	NA	1,700	1,300	NA
S21B3 4-5	8,400	160,000	315	15,000	250	10,000	30	NA	1,400	1,250	NA
S21B4 2-3	7,100	110,000	310	18,000	250	12,000	60	NA	1,000	1,250	NA
S21B4 7-9	3,150	62,000	315	12,000	250	7,000	90	NA	1,600	1,250	NA
S21B5 10-12	11,000	140,000	640	15,000	250	12,000	70	NA	910	1,250	NA
S21B5 2-4	13,000	200,000	310	23,000	250	14,000	220	NA	1,200	1,250	NA
S21B6 10-12	12,000	99,000	325	17,000	250	8,500	30	NA	1,000	1,300	NA
S21B6 2-4	6,000	110,000	295	25,000	250	96,000	60	NA	1,700	1,200	NA
Average Concentration - Only Samples With Metals Detections	**8,042**	**127,354**	**330.4**	**17,308**	**641**	**17,337**	**62**	**13,050**	**1,170**	**1,127**	**38,050**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 12 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 6-4
Groundwater Samples Used in Average Concentration Calculations in Area 5:
Industrial Water Treatment Plant
Boeing Tract 1, St. Louis, Missouri

	Volatile Organic Compounds	Total Petroleum Hydrocarbons	Polynuclear Aromatic Hydrocarbons	Polychlorinated Biphenyls	Metals
5					S21B1W

Note:
- analysis type not performed

Table 6-5(a)
Groundwater Constituents Average Concentrations for Metals in Area 5: Industrial Water Treatment Plant
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/l)				
	BARIUM	CHROMIUM	LEAD	MERCURY	SELENIUM
S21B1W	1,300	170	75	0.28	31
Average Concentration - Only Samples With Metals Detections	**1,300**	**170**	**75**	**0.28**	**31**

Notes:
ug/l - micrograms per liter
NA - Not Analyzed
Bold indicates a detection

Table 6-6(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Area 5: Industiral Water Treatment Plant
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
None	1	0	N/A	N/A	N/A	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	1	1	1.00	200,000	200,000	NA	N/A
TPH GRO	1	1	1.00	93,000	93,000	NA	N/A
Total Metals							
Arsenic	10	8	1.58	13,000	8,226	9,200	Y
Barium	10	10	1.56	200,000	128,530	725,000	N
Cadmium	10	2	2.00	720	359.5	<1,000	N
Chromium	10	10	1.42	25,000	17,580	58,000	N
Cyanide	10	1	0.66	160	241	NA	N/A
Lead	10	10	4.98	96,000	19,289	21,800	Y
Mercury	10	9	3.38	220	65	39	Y
Nickel	1	1	1.00	15,500	15,500	14,000	Y
Selenium	10	9	1.42	1,700	1,201	260	Y
Silver	10	1	0.39	450	1,165	<700	N
Zinc	1	1	1.00	41,200	41,200	49,000	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 6-6(b)
Soil Constituents of Concern Summary for Construction Worker for Area 5: Industrial Water Treatment Plant
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
None	1	0	N/A	N/A	N/A	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	1	1	1.00	200,000	200,000	NA	N/A
TPH GRO	1	1	1.00	93,000	93,000	NA	N/A
Total Metals							
Arsenic	13	10	1.62	13,000	8,042	9,200	Y
Barium	13	13	1.57	200,000	127,354	725,000	N
Cadmium	13	2	2.18	720	330.4	<1,000	N
Chromium	13	13	1.44	25,000	17,308	58,000	N
Cyanide	14	2	8.46	5,420	641	NA	N/A
Lead	13	13	5.54	96,000	17,337	21,800	Y
Mercury	13	12	3.55	220	62	39	Y
Nickel	2	2	1.19	15,500	13,050	14,000	Y
Selenium	13	11	1.45	1,700	1,170	260	Y
Silver	13	2	0.40	450	1,127	<700	N
Zinc	2	2	1.08	41,200	38,050	49,000	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 6-7
Groundwater Constituents of Concern Summary for Area 5: Industrial Water Treatment Plant
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
None	1	0	N/A	ND	N/A	N/A	N/A
Total Metals							
Barium	1	1	1.00	1,300	1,300	2,000	N
Chromium	1	1	1.00	170	170	100	Y
Lead	1	1	1.00	75	75	15	Y
Mercury	1	1	1.00	0.28	0.28	2	N
Selenium	1	1	1.00	31	31	50	N

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 6-8(a)

Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker

Area 5: IWTP, Boeing Tract 1, St. Louis, Missouri

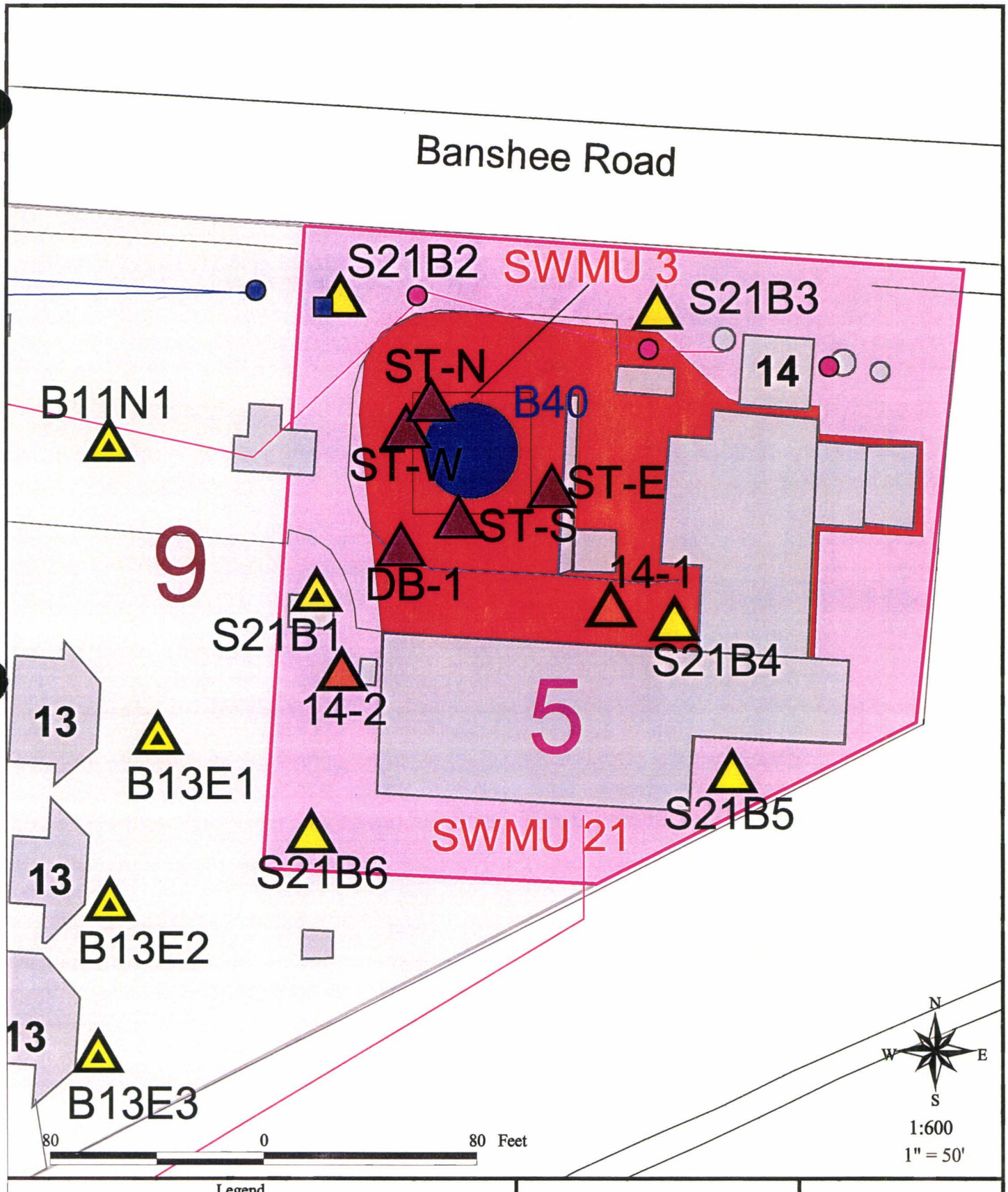
COCs	Average Soil Conc. (ug/kg)	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
		IELCR	HQ		IELCR	HQ		
TPH-GRO	93,000	NA	2.83E-04	---	---	---	NA	2.83E-04
TPH-DRO	200,000	NA	6.07E-05	---	---	---	NA	6.07E-05
TPH Total Risk		**NA**	**3.44E-04**		**NA**	**NA**	**NA**	**3.44E-04**
Arsenic	8,226	NA	NA	---	---	---	NA	NA
Chromium	---	---	---	170	NA	NA	NA	NA
Cyanide, total	241	NA	NA	---	---	---	NA	NA
Mercury	65	NA	1.83E-04	---	---	---	NA	1.83E-04
Nickel	15,500	NA	NA	---	---	---	NA	NA
Selenium	1,201	NA	NA	---	---	---	NA	NA
Metals Total Risk		**NA**	**1.83E-04**		**NA**	**NA**	**NA**	**1.83E-04**
CUMULATIVE RISK		**NA**	**5.27E-04**		**NA**	**NA**	**NA**	**5.27E-04**

Notes:
NA: Not available
---: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter

Table 6-8(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Futue Construction Worker
Area 5: IWTP, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
TPH-GRO	93,000	NA	NA	NA	4.23E-04	NA	3.00E-04	—	—	—	—	—	NA	7.23E-04
TPH-DRO	200,000	NA	4.41E-04	NA	1.34E-03	NA	2.13E-04	—	—	—	—	—	NA	2.00E-03
TPH Total Risk		NA	4.41E-04	NA	1.76E-03	NA	5.13E-04		NA	NA	NA	NA	NA	2.72E-03
Arsenic	8,042	2.00E-10	3.12E-05	6.34E-08	9.87E-03	1.06E-10	1.64E-06	—	—	—	—	—	6.37E-08	9.90E-03
Chromium	—	—	—	—	—	—	—	170	NA	NA	NA	NA	NA	NA
Mercury	62	NA	2.40E-07	NA	1.20E-05	NA	2.89E-04	—	—	—	—	—	NA	3.02E-04
Nickel	13,050	NA	3.79E-07	NA	2.53E-05	9.59E-12	1.40E-05	—	—	—	—	—	9.59E-12	3.96E-05
Selenium	1,170	NA	2.72E-05	NA	9.07E-05	NA	1.26E-06	—	—	—	—	—	NA	1.19E-04
Cyanide, total	641	NA	NA	NA	NA	NA	NA	—	—	—	—	—	NA	NA
Organics Total Risk		2.00E-10	5.90E-05	6.34E-08	9.99E-03	1.15E-10	3.06E-04		NA	NA	NA	NA	6.37E-08	1.04E-02
CUMULATIVE RISK		2.00E-10	5.00E-04	6.34E-08	1.18E-02	1.15E-10	8.19E-04		NA	NA	NA	NA	6.37E-08	1.31E-02

Notes:
NA: Not available
—: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter



Legend

- RCRA Closure Shallow Boring
- RFI Shallow Boring
- RFI Shallow Boring/Temp. Piezometer
- RFA Boring
- Industrial Sewer Line
- Storm Sewer Line
- Manhole (Type by Color)
- Storm Sewer Intake
- Storm Sewer Outlet
- UST
- SWMU

Drawn by: KLC Approved by:

Checked by: Date: December 5, 2003

Risk Assessment & Management Group, Inc.

Figure 6-1
Exposure Area 5:
Industrial Wastewater Treatment Plant,
Boeing Tract 1 South

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ATTACHMENT 6-A

ECOLOGICAL RISK ASSESSMENT – AREA 5 INDUSTRIAL WATER TREATMENT PLANT
TIER 1 SCREENING CHECKLIST FOR POTENTIAL RECEPTORS AND HABITAT CHECKLIST #1

1. Is the site less than ½ mile to a surface water resource (pond, river, lake, etc.)?

   Yes, Area 5 is located about 300 feet east of the portion of Coldwater Creek that flows through an enclosed culvert, and about 400 feet southeast of the portion of Coldwater Creek that enters an open culvert and continues to flow north.

2. Are wetlands (e.g. marshes, swamps, fens) on or adjacent to the site?

   No.

3. Are contaminated soils uncovered or otherwise accessible to ecological receptors and the elements?

   No, the site is mostly paved and covered with buildings and tanks.

4. Has a process (operational) discharge or storm water permit not been issued for the site?

   Site-wide, there is a storm water permit.

5. Is the site located in a known Karst environment (see Reference map)?

   No.

6. Are there federal or state rare, threatened, or endangered species on or within a ½ mile radius of the site? Note, the ½ mile radius limit does not necessarily apply to situations where a hydrogeological connection exists between the site and karsitic features.

   No.

7. Are there one or more environmentally sensitive areas (see Ecological Risk Assessment Figure #1 for definition) at or within a ½ mile radius of the site?

   No.

8. Are commercially or recreationally important species (fauna or flora) on or within a ½ mile radius of the site?

   No.

ATTACHMENT 6-B

ECOLOGICAL RISK ASSESSMENT – AREA 5 INDUSTRIAL WATER TREATMENT PLANT
TIER 1 SCREENING CHECKLIST FOR POTENTIAL RECEPTORS AND HABITAT CHECKLIST #2

1a. Can contaminants associated with the site leach, dissolve, or otherwise migrate to groundwater?

Yes, groundwater has been impacted.

1b. Are contaminants associated with the site mobile in groundwater?

Yes.

1c. Does groundwater from the site discharge into to ecological receptor habitat?

Yes, Coldwater Creek is located to the west of the site in an enclosed culvert, and flows north into an open culvert north of the adjacent Area 9.

1. Could contaminants associated with the site reach ecological receptors via groundwater?

No, groundwater impact is minimal, and located primarily about 300 feet from the creek, therefore impact is very unlikely.

2a. Is NAPL present at the site?

No.

2b. Is NAPL migrating?

No.

2c. Could NAPL discharge occur where ecological receptors are found?

No.

2. Could contaminants from the site reach ecological receptors via migration of NAPL?

No.

3a. Are contaminants present in surface soils?

Constituents have been detected in soil samples at depths of 1 to 5 feet bgs.

3b. Can contaminants be leached from or be transported by erosion of surface soils?

No, the site is mostly paved or covered with buildings and tanks.

3. Could contaminants reach ecological receptors via erosional transport of contaminated soil or via precipitation runoff?

No, the site is mostly paved or covered with buildings and tanks.

4a. Are contaminants present in surface soil or on the surface of the ground?

No.

4b. Are potential ecological receptors on the site?

No.

4. Could contaminants reach ecological receptors via direct contact?

No.

5a. Are contaminants present on the site volatile?

Yes.

5b. Could contaminants on the site be transported in air as dust or particulate matter?

No, the site is mostly paved or covered with buildings and tanks.

5. Could contaminants reach ecological receptors via inhalation of volatilized contaminants or contaminants adhered to dust in ambient air or in subsurface burrows?

No, the site is mostly paved or covered with buildings and tanks.

6a. Are contaminants present in surface and shallow subsurface soils or on the surface of the ground?

Yes, constituents have been detected in soil samples from depths of 1 to 33 feet.

6b. Are contaminants found in soil on the site taken up by plants growing on the site?

No, the site is mostly paved or covered with buildings and tanks.

6c. Do potential ecological receptors on or near the site feed on plants found on the site?

No, the site is mostly paved or covered with buildings and tanks.

6d. Do contaminants found on the site bioaccumulate?

Yes, some metals.

6. Could contaminants reach ecological receptors via ingestion of either soil, plants, animals, or contaminants directly?

No.

7a. Are there Karsitic features on or within a ½ mile radius of the site?

No.

7b. Is there a hydrogeological connection between the site and karsitic features such as seeps, springs, streams, or other surface water bodies?

No.

7. Could contaminants reach ecological receptors via transport through a Karst system?

No.

Section
7.0

7.1 INTRODUCTION

The GKN facility, designated Area 6 is located within the northern portion of the Facility, adjacent to the Norfolk and Western Railroad Company railroad tracts to the south, James S. McDonnell Boulevard to the northeast, and Lindberg Boulevard to the west (see Figure 7-1). This section will describe the constituents found here, the exposure model, the evaluation of the current and future risk to human health and the environment, and conclusions based on the results of the risk evaluation.

7.2 DESCRIPTION OF AREA

The GKN facility is approximately 4,000 feet long by 1,500 feet wide. Within this Area are three main buildings, five smaller buildings, and a large parking lot. The Area is currently paved. For the purposes of this risk evaluation, Area 6 will be further subdivided into four 6A, 6B, 6C, and 6D (see Figure 7-1):

- Sub-area 6A: Buildings 21, 29, and 29A, and all parking lots and open space to the south and west of these buildings;
- Sub-area 6B: Between Buildings 29 and 27, containing Buildings 22, 28, 39;
- Sub-area 6C: Buildings 25 and 27 and all parking lots and open space to the south and within about 450 feet to the east, and
- Sub-area 6D Parking lots and open areas beginning about 450 feet east of Buildings 25 and 27 and extending to the north, south, and east property lines.

Due to the large size of Area 6 and the presence of buildings that are likely to remain in the foreseeable future, Area 6 was subdivided to ensure that the representative concentrations calculated are as representative of the actual conditions as possible.

This Area formerly owned by Boeing has been sold to GKN Aerospace, who intends to continue aircraft maintenance and manufacturing activities into the future. As per Boeing's sale agreement with GKN, the Area has to be cleaned to allow the continuation of non-residential/industrial activities without unacceptable risk.

7.2.1 Potential Sources within Area

Potential sources (see Figure 7-1) within this Area include:

Sub-area 6A

- SWMU 29: Drum storage area for waste ferracoat, methyl ethyl ketone, and trichloroethylene.

Additionally, there was a former vapor degreaser inside Building 29 in Sub-area 6A.

Sub-area 6B

- SWMU 4: Waste Jet Aircraft Fuel UST (5,000-gallon capacity);
- SWMU 5: Less-than-90 Day Storage area for up to twenty-eight 55-gallon drums of cyanide and sulfide bearing wastes;
- SWMU 6: Former storage area for up to thirty-one 55-gallon drums of cyanide and sulfide bearing wastes;
- SWMU 8: Hazardous Waste Storage area for containers of acids, alkalis, paint sludges, oils, and solvents;
- SWMU 31: Maintenance shop 740-gallon waste oil AST; and
- SWMU 32: PCB storage area.

Additionally, there is a scrap metal recycling dock located in the northeastern portion of Sub-area 6B. As roll-off boxes of metal (aluminum, titanium, etc.) shavings and scrap are emptied into tractor trailers, water based cutting fluid is allowed to drain out. The fluid is captured and flows into an oil/water sump located below the dock. The water from the sump flows to the Boeing industrial waste treatment plant (IWTP) via the industrial waste sewer line.

Sub-area 6C

- SWMU 18: Methyl Ethyl Ketone and Methyl Isobutyl Ketone recovery (distillation) unit; and
- SWMU 30: Chemical etching spill containment area.

Additionally, there is a metal plating shop inside Building 27 in Sub-area 6C, consisting of several open top tanks of various acid solutions and rinses for electroplating chromium, cadmium, and nickel. A collection basin captures leaks and spills and via the industrial waste sewer line, the captured liquids flow to the IWTP.

In Sub-area 6C, there are numerous milling machinery pits with catch basins for aqueous cutting fluids within Building 27, and an aqueous degreaser at the northeast corner of Building 27.

Also in Sub-area 6C, two industrial wastewater sewer lines are located beneath the parking lot east of Building 27, which provide drainage from the plating and aluminum lines in Building 27 to the IWTP. In October 2000, a notable separation at an industrial sewer joint near boring B27E4 was discovered and repaired. Approximately 75 cubic yards of soil in proximity to the sewer line were excavated and disposed under an interim measure. These two industrial wastewater sewer lines extend into Sub-area 6D where they are combined into one line which continues to the south and east to the IWTP in Area 5.

USTs

A total of 16 USTs (see Table 7-1) have been identified within this Area, ranging in size from 250-gallons to 10,000-gallons. There was one UST located in Sub-area 6A, thirteen in Sub-area 6B, and two in Sub-area 6C. The contents of the USTs were leaded and unleaded gasoline, diesel, methyl alcohol, jet fuel, waste jet fuel, hydraulic oil, and fuel oil. Of these 16 USTs, only three currently remain, which are located within Sub-area 6B.

7.2.2 Soil Stratigraphy within Area

Based on soil boring logs for this Area, soil stratigraphy within this Area is silty clay from approximately 0.5 feet bgs to 75 feet bgs at which point limestone bedrock is encountered. No karst features have been identified in this Area. To evaluate the risk to indoor inhalation, the following average depths to soil source were used:

- Sub-area 6A 8.3 feet (253 cm) – defaulted to average depth to groundwater since calculated depth was 12 feet (366 cm).
- Sub-area 6B 4 feet (122 cm)
- Sub-area 6C 6 feet (183 cm)
- Sub-area 6D 7 feet (213 cm)

7.2.3 Hydrogeology within Area

Based on recent (since 2000) groundwater gauging data, groundwater flow within the shallow zone is to the east (see Figure 7-2), towards Coldwater Creek. Groundwater in this Area is present in shallow monitoring wells between approximately 2 feet bgs to 13 feet bgs. To evaluate the risk to indoor inhalation, the following average depths to groundwater were used:

- Sub-area 6A 8.3 feet (253 cm)
- Sub-area 6B 4.8 feet (146 cm)
- Sub-area 6C 10.0 feet (305 cm)
- Sub-area 6D 9.1 feet (277 cm)

7.3 LAND USE

7.3.1 Current Land Use

Current land use is non-residential, as the buildings are used for manufacturing purposes. Building # 27 contains a small basement on the east end of the building. It is approximately 30 X 75 feet with 18 - foot ceiling. Boeing sold this Area to GKN Aerospace in 2001.

7.3.2 Future Land Use

It is anticipated that future land use will continue to be non-residential, based on the long history of non-residential use at the site, and in the surrounding neighborhood, which is entirely non-residential.

7.4 AVAILABLE DATA

The following gives an overview of the available data within the Area.

- Ninety-five soil borings exist in this Area (7 in Sub-area 6A, 42 in Sub-area 6B, 39 in Sub-area 6C, and 7 in Sub-area 6D). Refer to Table 7-2.
- One hundred thirty-five soil samples including eight duplicates have been collected within this Area, since 1994 (7 in Sub-area 6A, 62 with 2 duplicates in Sub-area 6B, 50 with 5 duplicates in Sub-area 6C, and 16 with one duplicate in Sub-area 6D).
- Twenty-nine monitoring wells are located within this Area of which twenty-five are active and have been sampled at least once since 2000 (one active in Sub-area 6A, 10 of

13 active in Sub-area 6B, 12 of 13 active in Sub-area 6C, and 2 active in Sub-area 6D). See Table 7-3 for monitoring well information.

- Sixty-four soil borings were completed as piezometers within this Area and have been sampled for groundwater at least once since 2000 (4 in Sub-area 6A, 29 in Sub-area 6B, 26 in Sub-area 6C, and 5 in Sub-area 6 D).
- Three hundred sixty-five groundwater samples including 34 duplicate samples have been collected from this Area (19 with 3 duplicates from Sub-area 6A, 158 with 13 duplicates from Sub-area 6B, 133 with 15 duplicates from Sub-area 6C, and 55 with 3 duplicates in Sub-area 6D).

7.5 CONSTITUENTS IDENTIFIED WITHIN AREA

This section presents the soil and groundwater data for each of the three Sub-areas of Area 6.

7.5.1 Soil

A total of 135 soil samples including eight duplicate samples have been collected within Area 6, from 1994 to the present. Soil samples were analyzed during the various investigations conducted within this Area for a comprehensive list of constituents that included VOCs, SVOCs including PAHs, Pesticides, PCBs, TPH, metals, and cyanide. Typical laboratory methods that were used include SW 846 Methods 6010, 7060, 7421, 7470, 7471, 7740, 8015, 8021, 8081, 8082, 8151, 8240, 8260, 8310, 9012, 9060, OA1, and OA2. Appendix G includes comprehensive tables of the laboratory analysis data for constituents in soil that were detected in at least one sample from Area 6 (Appendix G-1A for Sub-area 6A, Appendix G-1B for Sub-area 6B, Appendix G-1C for Sub-area 6C, and Appendix G-1D for Sub-Area 6D). Table 7-4 presents a listing of the soil samples used in the risk calculations.

7.5.1.1 Sub-area 6A

Evaluation of the data in Appendix G-1A indicated that the following 9 constituents were detected in at least one soil sample from Sub-area 6A:

ORGANICS/TPH	METALS	
Acetone	Arsenic	Lead
Methyl ethyl ketone	Barium	Mercury
Chrysene	Chromium	Selenium

The laboratory analysis data for the above listed constituents, i.e., constituents that were detected in at least one sample, are presented in Tables 7A-5(a), 7A-5(b), and 7A-5(c). The soil data was further screened for potential exposures to the non-residential worker and construction worker.

Non-residential Worker

The non-residential worker data are constituents in soil samples collected above the groundwater table. No constituents were detected in soil samples from Sub-area 6A obtained above 8.3 feet bgs (average depth of groundwater table, see Table 1.12).

Construction Worker

The construction worker data are constituents in soil samples collected above the typical construction depth. To be conservative soil samples collected at or above a depth of 20 feet bgs are included.

The maximum detected concentrations of metals were compared with the background levels. Metals whose maximum detected concentrations did not exceed the background levels were eliminated from further consideration. Specifically for Sub-area 6A, the following metals were eliminated: barium, chromium, lead, and mercury. The following 5 constituents were considered further.

ORGANICS	METALS
Acetone	Arsenic
Methyl ethyl ketone	Selenium
Chrysene	

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for soil.

7.5.1.2 Sub-area 6B

Evaluation of the data in Appendix G-1B indicated that the following 47 constituents were detected in at least one soil sample from Sub-area 6B:

METALS		ORGANICS/TPH	
Aluminum	Iron	1,1-Dichloroethane	Vinyl chloride
Antimony	Lead	1,1-Dichloroethene	Xylenes, Total
Arsenic	Magnesium	1,2-Dichloroethene (total)	Acenaphthene
Barium	Manganese	Acetone	Acenaphthylene
Beryllium	Mercury	cis-1,2-Dichloroethene	Benzo(a)anthracene
Cadmium	Nickel	Ethylbenzene	Benzo(b)fluoranthene
Calcium	Potassium	Methyl ethyl ketone	Chrysene
Chromium	Sodium	Methylene chloride	Fluoranthene
Cobalt	Selenium	Tetrachloroethene	Fluorene
Copper	Vanadium	Toluene	Phenanthrene
	Zinc	trans-1,2-Dichlorobenzene	Pyrene
		trans-1,2-Dichloroethene	Aroclor 1254
		Trichloroethene	TPH (2 types)

The laboratory analysis data for the above listed constituents, i.e., constituents that were detected in at least one sample, are presented in Tables 7B-5(a), 7B-5(b), 7B-5(c), 7B-5(d), and 7B-5(e). The data was further screened for potential exposures to the non-residential worker and construction worker.

Non-residential Worker

The non-residential worker data are constituents detected in soil samples collected above the groundwater table. Soil samples collected at or above a depth of 4.8 feet bgs are included (Table 1-12).

The maximum detected concentrations of metals were compared with the background levels. Metals whose maximum detected concentrations did not exceed the background levels were eliminated from further consideration and included aluminum, barium, chromium, potassium, sodium, and vanadium. Note as discussed in Sections 1.9.11 and 1.9.12, lead and 1,2-dichloroethene (total) were also eliminated. Calcium and iron were not considered since they are ubiquitous in nature and have no known sources in this Sub-area. Magnesium was not considered because it has no toxicity and physical/chemical values. The following 30 constituents were considered further:

METALS		ORGANICS/TPH	
Antimony	Manganese	Acetone	Acenaphthene
Arsenic	Mercury	cis-1,2-Dichloroethene	Acenaphthylene
Beryllium	Nickel	Ethylbenzene	Benzo(a)anthracene
Cadmium	Selenium	Methylene chloride	Benzo(b)fluoranthene
Cobalt	Zinc	Tetrachloroethene	Chrysene
Copper		Toluene	Fluoranthene
		trans-1,2-Dichlorobenzene	Fluorene
		Trichloroethene	Pyrene
		Vinyl chloride	TPH
		Xylenes, total	

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for soil exposures to the non-residential worker.

Construction Worker

The construction worker data are constituents in soil samples collected above the typical construction depth. To be conservative, soil samples collected at or above a depth of 20 feet bgs are included.

The maximum detected concentrations of metals were compared with the background levels. Metals whose maximum detected concentrations did not exceed the background levels were eliminated from further consideration and included aluminum, barium, chromium, potassium, sodium, and vanadium. Note as discussed in Sections 1.9.11 and 1.9.12, lead and 1,1-Dichloroethene (total) were also eliminated. Calcium and iron were not considered since they are ubiquitous in nature and have no known sources in this Sub-area. Magnesium was not considered because it has no toxicity and physical/chemical values. The following 36 constituents were considered further:

METALS		ORGANICS/TPH	
Antimony	Manganese	1,1 – Dichloroethane	Xylenes, total
Arsenic	Mercury	1,1-Dichloroethene	Acenaphthene
Beryllium	Nickel	Acetone	Acenaphthylene
Cadmium	Selenium	cis-1,2-Dichloroethene	Benzo(a)anthracene
Cobalt	Zinc	Ethylbenzene	Benzo(b)fluoranthene
Copper		Methyl ethyl ketone	Chrysene
		Methylene chloride	Fluoranthene
		Tetrachloroethene	Fluorene
		Toluene	Phenanthrene
		trans-1,2-Dichlorobenzene	Pyrene
		trans-1,2-Dichloroethene	Aroclor 1254
		Trichloroethene	TPH
		Vinyl chloride	

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for soil exposures to the construction worker.

7.5.1.3 Sub-area 6C

Evaluation of the data in Appendix G-1C indicated that the following 24 constituents were detected in at least one soil sample from Sub-area 6C:

METALS	ORGANICS/TPH	
Arsenic	1,2-Dichloroethene(total)	Methyl isobutyl ketone
Barium	Acetone	o-Xylene
Cadmium	Chloroform	Trichloroethene
Chromium	cis-1,2-Dichloroethene	Xylenes, Total
Lead	Dichlorodifluoromethane	Benzo(a)anthracene
Mercury	Ethylbenzene	Benzo(b)fluoranthene
Selenium	Methylene Chloride	Chrysene
	Methyl ethyl ketone	Fluoranthene
		TPH (3 types)

The laboratory analysis data for the above listed constituents, i.e., constituents that were detected in at least one sample, are presented in Tables 7C-5(a), 7C-5(b), 7C-5(c), and 7C-5(d). Methylene chloride was not considered further since it was the only VOC detected in those specific samples. The data was further screened for potential exposures to the non-residential worker and construction worker.

Non-residential Worker

The non-residential worker data are constituents in soil samples collected above the groundwater table. Soil samples collected or above a depth of 10 feet bgs are included (Table 1-12).

The maximum detected concentrations of metals were compared with the background levels. Metals whose maximum detected concentrations did not exceed the background levels were

eliminated from further consideration and included barium, cadmium, and lead. Note as discussed in Section 1.9.12, 1,2-dichloroethene (total) was also eliminated. The following 15 constituents were considered further:

METALS		ORGANICS/TPH	
Arsenic	Mercury	Acetone	o-Xylene
Chromium	Selenium	cis-1,2-Dichloroethene	Trichloroethene
		Dichlorodifluoromethane	Xylenes, total
		Ethylbenzene	Chrysene
		Methyl ethyl ketone	TPH
		Methyl isobutyl ketone	

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for soil exposures to the non-residential worker.

Construction Worker

The construction worker data are constituents in soil samples collected above the typical construction depth. To be conservative, soil samples collected at or above a depth of 20 feet bgs in Sub-area 6C are included.

The maximum detected concentrations of metals were compared with the background levels. Metals whose maximum detected concentrations did not exceed the background levels were eliminated from further consideration and included barium and lead. Note as discussed in Section 1.9.12, 1,1-dichloroethene(total) was also eliminated. The following 20 constituents were considered further:

METALS		ORGANICS/TPH	
Arsenic	Mercury	Acetone	o-Xylene
Cadmium	Selenium	Chloroform	Trichloroethene
Chromium		cis-1,2-Dichloroethene	Xylenes, total
		Dichlorodifluoromethane	Benzo(a)anthracene
		Ethylbenzene	Benzo(b)fluoranthene
		Methyl ethyl ketone	Chrysene
		Methyl isobutyl ketone	Fluoranthene
			TPH

7.5.1.4 Sub-area 6D

Evaluation of the data in Appendix G-1D indicated that the following 10 constituents were detected in at least one soil sample from Sub-area 6D:

METALS	ORGANICS/TPH	
Arsenic	Dichlorodifluoromethane	Toluene
Barium	Methyl ethyl ketone	TPH (3 types)
Cadmium		
Chromium		
Lead		
Mercury		

The laboratory analysis data for the above listed constituents, i.e., constituents that were detected in at least one sample, are presented in Tables 7D-5(a), 7D-5(b), and 7D-5(c). The data was further screened for potential exposures to the non-residential worker and construction worker.

Non-residential Worker

The non-residential worker data are constituents in soil samples collected above the groundwater table. Soil samples collected at or above a depth of 9.1 feet bgs are included (Table 1-12).

The maximum detected concentrations of metals were compared with the background levels. Metals whose maximum detected concentrations did not exceed the background levels were eliminated from further consideration and included arsenic, barium, cadmium, chromium and lead. The following 3 constituents were considered further:

ORGANICS/TPH	
Dichlorodifluoromethane	TPH
Toluene	

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for soil exposures to the non-residential worker.

Construction Worker

The construction worker data are constituents in soil samples collected above the typical construction depth. To be conservative, soil samples collected at or above a depth of 20 feet bgs are included.

The maximum detected concentrations of metals were compared with the background level. Metals whose maximum detected concentrations did not exceed the background levels were eliminated from further consideration and included barium, cadmium, chromium, lead and mercury. The following 5 constituents were considered further:

METALS	ORGANICS/TPH	
Arsenic	Dichlorodifluoromethane	Toluene
	Methyl ethyl ketone	TPH

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for soil exposures to the construction worker.

7.5.2 Groundwater

Within this Area, 89 groundwater sampling points exist, which have been sampled recently for a total of 362 samples including 34 duplicate samples. Groundwater samples were analyzed during the various investigations conducted within this Area for a comprehensive list of constituents that included VOCs, PCBs, Pesticides, SVOCs including PAHs, TPH, metals, and cyanide. Typical laboratory analysis methods that were used include SW 846 Methods 3510/DRO, 3550/DRO, 6010, 7196, 7470, 8015, 8021, 8081, 8082, 8260, 8310, 9012, OA1, OA2, TX 1005, and TX 1006. Appendix G-2 includes comprehensive tables of the laboratory analysis data for constituents in ground water that were detected in at least one sample from Area 6 (Appendix G-2A for Sub-area 6A, Appendix G-2B for Sub-area 6B, Appendix G-2C for Sub-area 6C, and Appendix G-2D for Sub-area 6D). Table 7-6 presents the list of samples used in the risk calculations.

7.5.2.1 Sub-area 6A

Evaluation of the data in Tables 7A-7(a), 7A-7(b), and 7A-7(c) indicated that the following 17 constituents were detected in at least one ground water sample from Sub-area 6A:

ORGANICS/TPH		METALS	
Acetone	cis-1,2-Dichloroethene	Arsenic	Lead
Benzene	Dibromochloromethane	Barium	Mercury
Bromodichloromethane	Methylene Chloride	Cadmium	Selenium
Carbon disulfide	Trichloroethene	Chromium	
Chloroform	TPH (1 type)		

The maximum detected concentration for each constituent was compared with various screening criteria. Constituents for which the screening criteria exceeded the maximum detected concentration were eliminated from further consideration. The constituents eliminated from further consideration included acetone, bromodichloromethane, carbon disulfide, chloroform, cis-1,2-dichloroethene, dibromochloromethane, methylene chloride, trichloroethene, mercury and selenium. Note as discussed in Section 1.9.11, lead was also eliminated. The remaining constituents consist of 1 VOC, TPH, and 4 metals. These 6 constituents are listed in the following table:

ORGANICS/TPH	METALS	
Benzene	Arsenic	Cadmium
TPH (1 type)	Barium	Chromium

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for ground water.

7.5.2.2 Sub-area 6B

Evaluation of the data in Tables 7B-7(a), 7B-7(b), 7B-7(c) , 7B-7(d), and 7B-7(e) indicated that the following 48 constituents were detected in at least one ground water sample from Sub-area 6B:

METALS	ORGANICS/TPH	
Arsenic	1,1,2-Trichloro-1,2,2-trifluoroethane	Isopropylbenzene
Barium	1,1-Dichloroethane	Methyl ethyl ketone
Cadmium	1,1-Dichloroethene	Methyl tertiary-butyl ether
Chromium	1,2,3-Trimethylbenzene	Methylene chloride
Lead	1,2,4-Trimethylbenzene	n-Propylbenzene
Manganese	1,2-Dichlorobenzene	sec-Butylbenzene
Mercury	1,2-Dichloroethene (total)	tert-Butylbenzene
Selenium	1,2-Dichloropropane	Tetrachloroethene
Silver	1,3-Dichlorobenzene	Toluene
	1,4-Dichlorobenzene	trans-1,2-Dichloroethene
	Acetone	Trichloroethene
	Benzene	Trichlorofluoromethane
	Bromodichloromethane	Vinyl chloride
	Bromomethane	Xylenes, total
	Carbon disulfide	Acenaphthene
	Chloroethane	Benzo(a)anthracene
	Chloroform	Chrysene
	cis-1,2-Dichloroethene	Aroclor 1254
	Dichlorodifluoromethane	TPH (5 types)
	Ethylbenzene	

The maximum detected concentration for each constituent was compared with various screening criteria. Constituents for which the screening criteria exceeded the maximum detected concentration were eliminated from further consideration. The constituents eliminated from further consideration included 1,1-dichloroethane, 1,2-dichlorobenzene, 1,2-dichloropropane, 1,3-dichlorobenzene, 1,4-dichlorobenzene, acetone, acenaphthene, bromodichloromethane, carbon disulfide, chloroethane, chloroform, chrysene, dichlorodifluoromethane, ethylbenzene, isopropylbenzene, methyl ethyl ketone, n-propylbenzene, sec-butylbenzene, tert-butylbenzene, toluene, trichlorofluoromethane, xylenes (total), selenium, and silver. Note as discussed in Sections 1.9.11 and 1.9.12, lead and 1,2-dichloroethene (total) were also eliminated. The remaining constituents consist of 13 VOCs, 1 PAH, 1 PCB, 6 metals, and TPH (5 types). This includes detected constituents that exceeded the target level criteria, detected constituents that did not have target level criteria for comparison, and all types of TPH that were analyzed whether detected or not. These 22 constituents are listed in the following table:

METALS	ORGANICS/TPH	
Arsenic	1,1,2-Trichloro-1,2,2-trifluoroethane	Methylene chloride
Barium	1,1-Dichloroethene	Tetrachloroethene
Cadmium	1,2,3-Trimethylbenzene	trans-1,2-Dichloroethene
Chromium	1,2,4-Trimethylbenzene	Trichloroethene
Manganese	Benzene	Vinyl chloride
Mercury	Bromomethane	Benzo(a)anthracene
	cis-1,2-Dichloroethene	Aroclor 1254
	Methyl tertiary-butyl ether	TPH (5 types)

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for ground water.

7.5.2.3 Sub-area 6C

Evaluation of the data in Tables 7C-7(a), 7C-(b), and 7C-(c) indicated that the following 29 constituents were detected in at least one ground water sample from Sub-area 6C:

METALS	ORGANICS/TPH	
Arsenic	1,1,2-Trichloroethane	Dichlorodifluoromethane
Barium	1,1-Dichloroethene	Methylene chloride
Cadmium	1,2-Dichloroethene (total)	Methyl ethyl ketone
Chromium	2-Hexanone	Methyl isobutyl ketone
Iron	Acetone	Tetrachloroethene
Lead	Benzene	Toluene
Mercury	Bromodichloromethane	Trichloroethene
Selenium	Carbon disulfide	trans-1,2-Dichloroethene
	Carbon tetrachloride	Vinyl chloride
	Chloroform	TPH (5 types)
	cis-1,2-Dichloroethene	

The maximum detected concentration for each constituent was compared with various screening criteria. Constituents for which the screening criteria exceeded the maximum detected concentration were eliminated from further consideration. The constituents eliminated from further consideration included 1,1,2-trichloroethane, 1,1-dichloroethene, acetone, benzene, bromodichloromethane, carbon disulfide, carbon tetrachloride, chloroform, dichlorodifluoromethane, methyl ethyl ketone, methyl isobutyl ketone, toluene, tetrachloroethene, trans-1,2-dichloroethene, and selenium. Note as discussed in Sections 1.9.11 and 1.9.12, lead and 1,2-dichloroethene (total) were also eliminated. The remaining constituents consist of 4 VOCs, TPH, and 5 metals. These 10 constituents are listed in the following table:

METALS	ORGANICS/TPH	
Arsenic	2-Hexanone	Trichloroethene
Barium	cis-1,2-Dichloroethene	Vinyl chloride
Cadmium		TPH (5 types)
Chromium		
Mercury		

7.5.2.4 Sub-area 6D

Evaluation of the data in Tables 7D-7(a) and 7D-7(b) indicated that the following 13 constituents were detected in at least one ground water sample from Sub-area 6D:

METALS	ORGANICS/TPH	
Arsenic	1,1,1-Trichloroethane	Tetrachloroethene
Barium	1,1-Dichloroethane	Toluene
Cadmium	1,1-Dichloroethene	Trichloroethene
Chromium	cis-1,2-Dichloroethene	
Lead		
Mercury		

The maximum detected concentration for each constituent was compared with various screening criteria. Constituents for which the screening criteria exceeded the maximum detected concentration were eliminated from further consideration. The constituents eliminated from further consideration included 1,1,1-trichloroethane, 1,1-Dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, toluene, trichloroethene, barium, cadmium and mercury. Note as discussed in Section 1.9.11, lead was also eliminated. The remaining constituents consist of 1 VOC and 2 metals. These 3 constituents are listed in the following table:

METALS	ORGANICS/TPH
Arsenic	Tetrachloroethene
Chromium	

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for ground water.

7.6 FREE PRODUCT

The only evidence of free product in Area 6 since investigations began in 2000 was during the groundwater sampling of temporary piezometer RC2 on July 25, 2000. During sampling an oil sheen and thin emulsion of dark brown product with a cutting oil odor was observed on the groundwater. However, no measurable free product has been observed in Area 6, and no evidence of free product has been observed since the July 2000 sampling of RC2. Therefore, it is our opinion that the sheen observed was very localized and does not indicate the presence of a free product plume.

7.7 CURRENT REMEDIATION ACTIVITIES

Within Sub-area 6B, remediation activities are currently on-going in an effort to reduce the groundwater concentrations of the chlorinated solvents observed around MW-3 in the northern part of the Sub-area. Hydrogen Release Compound (HRC) was injected into this area via nine borings or injection points located around MW-3 on June 18, 2002. Since the time of injection, three wells; MW-3A, MW-3, and MW-3B have been sampled monthly to monitor the enhanced

attenuation. This remediation strategy is currently being tested within this Sub-area to determine its suitability for more widespread use at the site, should further remediation be necessary.

7.8 EXPOSURE MODEL

7.8.1 Current Conditions for Sub-areas 6A, 6B, 6C, and 6D

Under current conditions, all four Sub-areas are in use as commercial manufacturing facilities; therefore, the receptor of concern is the non-resident in each of the three Sub-areas. Exhibit 7-1 presents the EM for the non-resident in any of the four Sub-areas.

EXHIBIT 7-1. EM CURRENT ON-SITE NON-RESIDENTIAL WORKER FOR AREA 6 (SUB-AREAS 6A, 6B, 6C AND 6D)

Scenario, Receptor, and Pathways / Routes Analyzed	C or NC	Justification
Dermal Contact with Surficial Soil	NC	The Area is entirely paved; therefore, contact with surficial soil is unlikely.
Ingestion of Surficial Soil	NC	The Area is entirely paved and likely to remain so; therefore, ingestion of surficial soil is unlikely.
Indoor Inhalation of Vapors from Subsurface Soil	**C**	**A number of volatile constituents were identified in soil within this Area; hence, inhalation is possible.**
Indoor Inhalation of Vapors from Groundwater	**C**	**A number of volatile constituents were identified in groundwater within this Area; hence inhalation is possible.**

Notes: **NC:** Not Complete **C:** Complete

Exposure pathways highlighted in bold indicate that these pathways are complete and will be quantitatively evaluated.

7.8.2 Future Conditions for Sub-areas 6A, 6B, 6C, and 6D

Under future conditions, the land use and the locations of the buildings is anticipated to remain the same. Hence the comparison of current conditions will be protective of the future non-resident, as it is anticipated that any impact observed within this Area will continue to naturally attenuate, and concentrations will decline in the future.

Construction work could be performed anywhere within Area 6 in the future. Exhibit 7-2 presents the EM for the potential future construction worker in any of the four Sub-areas.

EXHIBIT 7-2. EM POTENTIAL FUTURE ON-SITE CONSTRUCTION WORKER FOR AREA 6 (SUB-AREAS 6A, 6B, 6C, AND 6D)		
Scenario, Receptor, and Pathways / Routes Analyzed	**C or NC**	**Justification**
Dermal Contact with Soil	**C**	**Soil is impacted at depths less than 20 feet bgs which is considered the construction zone; therefore, contact is possible.**
Accidental Ingestion of Soil	**C**	**Soil is impacted at depths less than 20 feet bgs which is considered the construction zone; therefore, ingestion is possible.**
Outdoor Inhalation of Vapors and Particles from Soil	**C**	**Soil is impacted within this Area, and a number of volatile constituents were identified in soil within this Area; therefore, this pathway is complete.**
Dermal Contact with Groundwater	**C**	**The depth to groundwater intersects with the typical depth of construction; therefore, this pathway is complete.**
Outdoor Inhalation of Vapors from Groundwater	**C**	**A number of volatile constituents were identified in groundwater within this Area, hence this pathway is complete.**
Notes: **NC:** Not Complete **C:** Complete Exposure pathways highlighted in bold indicate that these pathways are complete and will be quantitatively evaluated.		

7.9 REPRESENTATIVE CONCENTRATIONS

The representative concentration for the non-resident, under current conditions is the Sub-area-wide average soil and groundwater concentration. This has been used as the majority of the samples have been collected from locations where a source has been identified; hence, the concentration derived will be very conservative compared with the actual concentrations beneath the buildings. Also, most of the sampling locations are around the periphery of the buildings. For the construction worker, the representative concentration will also be the Sub-area-wide average as the location of future construction work is unknown.

The ratio of the maximum detected concentration to the average concentration is presented in the 7-8(a), 7-8(b), and 7-9 series tables. Constituents and samples for which this ratio exceeds 10 have been identified. The results of this evaluation are presented as follows for each Sub-area.

7.9.1 Sub-area 6A

Tables 7A-8(a), 7A-8(b), and 7A-9 present the representative concentrations for soil and groundwater. The ratio of the maximum detected concentration to the average concentration was calculated for each constituent for soil and groundwater and are shown on the tables. For this Sub-area the ratio of maximum detected concentration to the average concentration did not exceed 10 for the COCs in soil or groundwater.

7.9.2 Sub-area 6B

Tables 7B-8(a), 7B-8(b), and 7B-9 present the representative concentrations for soil and groundwater. The ratio of the maximum detected concentration to average concentration is also presented. Following are the constituents and the samples for which this ratio exceeds 10:

SOIL – CONSTRUCTION WORKER	
COCs	**Locations**
cis-1,2-Dichloroethene	B27W3-8
Ethylbenzene	B28-N-D (SWMU-4)
Toluene	B28-N-D (SWMU-4)
Vinyl chloride	B27W3-8

GROUNDWATER	
COCs	**Locations**
1,1,2-Trichloro-1,2,2-trifluoroethane	B28MW4
1,2-Dichlorobenzene	B28MW1
Benzene	B28MW4
cis-1,2-Dichloroethene	MW3, B27W3S
Dichlorodifluoromethane	B28MW4
MTBE	B28MW4
Methylene chloride	MW3
Tetrachloroethene	HW1
Vinyl chloride	MW3, B27W3S
Trichloroethene	MW3
TPH-DRO	RC2
Barium	B22E2
Mercury	B28MW3

Several of these chemicals were at concentrations several orders of magnitude below the acceptable HQ of 1 and the acceptable IELCR of 1×10^{-5}, refer Tables 7B-10(a) and 7B-10(b). Thus, the target risk will not exceed unacceptable levels. However, to be conservative, we have identified those constituents whose concentrations are within two orders of magnitude of acceptable risk (i.e. those chemicals with an IELCR $>1 \times 10^{-7}$ and/or HQ > 0.01 for any receptor).

Based on this comparison, two constituents in groundwater, vinyl chloride in the vicinity of MW3 and B27W3S, and TPH-DRO in the vicinity of RC2, are within two orders of magnitude of acceptable risk.

7.9.3 Sub-area 6C

Tables 7C-8(a), 7C-8(b), and 7C-9 present the representative concentrations for soil and groundwater. The ratio of the maximum detected concentration to average concentration is also presented. Following are the constituents and the samples for which this ratio exceeds 10:

SOIL – CONSTRUCTION WORKER	
COCs	**Locations**
Ethylbenzene	B20E1-6
Xylenes, total	B20E1-6

GROUNDWATER	
COCs	**Locations**
Trichloroethene	B27E1
Barium	B27E9
Chromium	B27E1
Mercury	B27E9
Lead	B27E7

Several of these chemicals were at concentrations several orders of magnitude below the acceptable HQ of 1 and the acceptable IELCR of 1×10^{-5}, refer Tables 7C-10(a) and 7C-10(b). Thus, the target risk will not exceed unacceptable levels. However, to be conservative, we have identified those constituents whose concentrations are within two orders of magnitude of acceptable risk (i.e. those chemicals with an IELCR $>1 \times 10^{-7}$ and/or HQ > 0.01 for any receptor).

Based on this comparison, one constituent in groundwater, trichloroethene in the vicinity of B27E1, is within two orders of magnitude of acceptable risk.

7.9.4 Sub-area 6D

Tables 7D-8(a), 7D-8(b), and 7D-9 present the representative concentrations for soil and groundwater. The ratio of the maximum detected concentration to the average concentration was calculated for each constituent for soil and groundwater and are shown on the tables. For this Sub-area the ratio of maximum detected concentration to the average concentration did not exceed 10 for the COCs in soil or groundwater.

7.10 CALCULATION OF RISK

Tables 7A-10(a), 7B-10(a), 7C-10(a), and 7D-10(a) present the results for the non-residential worker for Sub-area 6A, Sub-area 6B, Sub-area 6C, and Sub-area 6D, respectively. Tables 7A-10(b), 7B-10(b), 7C-10(b), and 7D-10(b) present the results for the construction worker for Sub-area 6A, Sub-area 6B, Sub-area 6C, and Sub-area 6D, respectively. The tables present the carcinogenic (IELCR) and non-carcinogenic (HQ and HI) risks for:

- Each COC,
- Each route of exposure,
- Cumulative risk for each COC,
- Cumulative risk for each route of exposure, and
- Total risk which is the sum of risk for all the COCs and all the routes of exposures.

Based on these tables, following are the key observations.

7.10.1 Sub-area 6A

7.10.1.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 7A-10(a), the cumulative IELCR is 1.12×10^{-10} that is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5} clearly the risk for each COC and each route of exposure would be less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 7A-10(a), the cumulative HI is 0.054 that is well below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

7.10.1.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 7A-10(b), the cumulative IELCR is 5.33×10^{-8} that is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5} clearly the risk for each COC and each route of exposure would be less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 7A-10(b), the cumulative HI is 0.0089 that is well below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

7.10.2 Sub-area 6B

7.10.2.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 7B-10(a) the cumulative IELCR is 1.44×10^{-6} which is below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5} clearly the risk for each COC and each route of exposure would be less than 1×10^{-5}– the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 7B-10(a) the cumulative HI for all COCs and all routes of exposure is 7.9, which exceeds the regulatory acceptable level of 1.0. Further examination of the table indicates that the HQ for indoor inhalation of aliphatics >nC16 to nC21 from groundwater is 6.9, i.e., the contribution to the HI from all the other COCs and routes of exposure is relatively small.

7.10.2.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 7B-10(b), the cumulative IELCR is 2.44×10^{-5} that is below the regulatory acceptable level of 1×10^{-4}. However, further examination of the table indicates that the IELCR for dermal contact of benzo(a)anthracene from groundwater is 2.36×10^{-5}, which resulted in the risk level for benzo(a)anthracene and routes of exposure greater than the regulatory acceptable risk level of 1×10^{-5}.

Non-carcinogenic Risk:

As shown in Table 7B-10(b), the cumulative HI is 0.17 that is below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

7.10.3 Sub-area 6C

7.10.3.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 7C-10(a) the cumulative IELCR is 7.03×10^{-8} which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and each route of exposure would be less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 7C-10(a) the cumulative HI for all COCs and all routes of exposure is 4.1, which exceeds the regulatory acceptable level of 1.0. Further examination of the table indicates that the HQs for indoor inhalation of aliphatics >nC16 to nC21 and aliphatics >nC21 to nC35 from groundwater are 2.2 and 1.1, i.e., the contribution to the HI from all the other COCs and routes of exposure is negligible.

7.10.3.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 7C-10(b), the cumulative IELCR is 8.36×10^{-8} that is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and each route of exposure would be less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 7C-10(b), the cumulative HI is 0.06 that is well below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

7.10.4 Sub-area 6D

7.10.4.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 7D-10(a) the cumulative IELCR is 2.99×10^{-10} which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and each route of exposure would be less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 7D-10(a) the cumulative HI for all COCs and all routes of exposure is 0.00014, which is well below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

7.10.4.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 7D-10(b), the cumulative IELCR is 8.25×10^{-8} that is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and each route of exposure would be less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 7D-10(b), the cumulative HI is 0.013 that is below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

7.11 ECOLOGICAL RISK

The Tier 1 ecological screening checklists have been completed for this Area, and are presented as Attachment 7-A and Attachment 7-B. These checklists identified some potential for dissolved groundwater impacts to migrate to Coldwater Creek located adjacent to the east of Sub-area 6D. An evaluation of the future potential for residual impacts to migrate and impact Coldwater Creek will be performed in accordance with the procedures included in the MRBCA program. This evaluation will be presented in an addendum to this report.

7.12 CONCLUSIONS

Carcinogenic and non-carcinogenic risks to the construction worker and the non-residential worker were calculated for each Sub-area. Key conclusions of the risk evaluation are:

Sub-area 6A

The calculated risks for all the COCs and all potentially complete routes of exposure for the no-residential worker and the construction worker are below the acceptable target risks.

Sub-area 6B

The cumulative non-carcinogenic risk for the non-residential worker exceeded the target risk. The primary contributor to the risk was indoor inhalation of vapor from aliphatics >nC16 to nC21 in groundwater. The calculated carcinogenic risk for the non-residential worker was below the acceptable target risk.

The calculated risks for all COCs and all potentially complete routes of exposure for the construction worker are below the regulatory acceptable level. However, the carcinogenic risk of benzo(a) anthracene exceeded the target risk for dermal contact of groundwater.

Sub-area 6C

The cumulative non-carcinogenic risk for the non-residential worker exceeded the target risk. The primary contributor to the risk was indoor inhalation of vapor from aliphatics >nC16 to nC21 and aliphatics >nC21 to >nC35 in groundwater. The calculated carcinogenic risk for the non-residential worker was below the acceptable target risk.

The calculated risks for all COCs and all potentially complete routes of exposure for the construction worker are below the regulatory acceptable level.

Sub-area 6D

The calculated risks for all the COCs and all potentially complete routes of exposure for the no-residential worker and the construction worker are below the acceptable target risks.

Table 7-1
Summary of Underground Storage Tanks (USTs) Present Historically within Area 6: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sub-area	UST Number	Location	Volume (Gallons)	Contents	Construction Materials	Year Installed	Status	Comments
Sub-area 6A	B66	Building 29	4,000	Hydraulic Oil	Single Wall Fiberglass	1980	Removed 1994	Excavated
Sub-area 6B	B52	Building 22	5,000	Leaded Gasoline	Single Wall Steel	1942	Removed 1961	Excavated
	B53	Building 22	7,520	Leaded Gasoline	Single Wall Steel	1961	Removed 1989	Excavated
	B54	Building 22	8,000	Unleaded Gasoline	Double Wall Fiberglass	1989	Active	Retrofitted in 1995
	B55	Building 22	10,000	Unleaded Gasoline	Single Wall Fiberglass	1981	Removed 1995	Excavated
	B56	Building 22	10,000	Unleaded Gasoline	Double Wall Plastic Coated Steel	1995	Active	No action
	B57	Building 22	10,000	Diesel	Single Wall Fiberglass	1981	Removed 1995	Excavated
	B58	Building 22	10,000	Diesel	Double Wall Plastic Coated Steel	1995	Active	No action
	B60	Building 28	5,000	Jet fuel	Single Wall Steel	1955	Removed 1989	Excavated
	B61	Building 28	5,000	Jet fuel	Single Wall Steel	1955	Removed 1989	Excavated
	B62	Building 28	5,000	Waste Jet Fuel	Single Wall Steel	1953	Removed 1989	Excavated
	B63	Building 28	5,000	Jet fuel	Double Wall Steel	1989	Removed 2000	Excavated
	B64	Building 28	5,000	Jet fuel	Double Wall Steel	1989	Removed 2000	Excavated
	B65	Building 28	5,000	Waste Jet Fuel	Double Wall Steel	1989	Removed 2000	Excavated
Sub-area 6C	B59	Building 25	8,000	Methyl Alcohol	Single Wall Steel	1984	Removed 1995	Excavated
	B67	Building 20	250	Fuel Oil	Single Wall Steel	1943	Removed 1999	Excavated

Notes:
UST B65 replaced UST B62
USTs B63 and B64 replaced USTs B60 and B61

Table 7-2
Soil Boring Information for Area 6: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sub-area	Boring	Date Drilled	Boring	Date Drilled
Sub-area 6A	B21S1	7/19/2000	MW-1	7/17/2000
	B29AW1	7/24/2000	RR1	9/22/2000
	B29E1	7/20/2000	RR2	9/19/2000
	B29I1	7/25/2000		
Sub-area 6B	B28-N	12/6-7/1993	HW1	7/24/2000
	B28-S	12/6-7/1993	MW-3	7/19/2000
	39-1	11/1/1994	MW-7	7/19/2000
	39-2	11/1/1994	MW9S	9/18/2000
	39-3	11/1/1994	PB1	7/24/2000
	22-1	11/1/1994	RC10	11/13/2000
	22-2	11/1/1994	RC11	12/7/2000
	S31B1	6/1/1998	RC12	12/7/2000
	S31B2	6/1/1998	RC1	7/25/2000
	S31B3	6/1/1998	RC2	7/25/2000
	B22E1	7/24/2000	RC3	7/25/2000
	B22E2	7/25/2000	RC4	9/18/2000
	B22E3	7/25/2000	RC5	9/18/2000
	B22N1	7/24/2000	RC6	9/18/2000
	B22W1	7/24/2000	RC7	9/18/2000
	B27W1	9/18/2000	RC8	9/18/2000
	B27W2	9/18/2000	RC9	11/13/2000
	B27W3	9/18/2000	RR5	9/20/2000
	B28E1	7/26/2000	SBW-1 (SB1)	NA
	B28N1	7/26/2000	SBW-3 (SB3)	NA
	CN1	7/24/2000	TH-2	NA
Sub-area 6C	B20E1	7/19/2000	B27I4	7/21/2000
	B20E2	7/19/2000	B27I5	7/21/2000
	B27E10	11/13/2000	B27I6	7/25/2000
	B27E15	7/25/2003	B27I7	7/21/2000
	B27E1	7/20/2000	B27I8	7/21/2000
	B27E2	7/19/2000	B27I9	7/25/2000
	B27E3	9/18/2000	B27S1	7/19/2000
	B27E4	9/18/2000	B27S2	7/19/2000
	B27E5	9/19/2000	B27S3	7/19/2000
	B27E6	9/19/2000	EPE1	7/20/2000
	B27E7	11/13/2000	EPE2	7/20/2000
	B27E8	11/13/2000	MW-5	7/18/2000
	B27E9	11/13/2000	MW5AD	9/20/2000
	B27I10	11/14/2000	MW-8	7/18/2000
	B27I1	7/21/2000	MW8AD	9/21/2000
	B27I11	11/14/2000	MW8AS	9/21/2000
	B27I12	7/22/2003	RR3	9/19/2000
	B27I13	7/22/2003	RR4	9/19/2000
	B27I2	7/21/2000	B27E11	11/14/2000
	B27I3	7/21/2000		
Sub-area 6D	B27E12	7/2/2003	MW-6	7/19/2000
	B27E13	7/25/2003	MW6D	9/20/2000
	B27E14	7/25/2003	SEWER	12/6/2000
	B27E16	7/2/2003		

Note:
NA: Not available

Table 7-3
Monitoring Well Information within Area 6: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sub-area	Monitoring Well	Diameter (inches)	Screened Interval (ft bgs)	Total Depth (ft)	Installation Date	Status	# of Times Sampled
Sub-area 6A	MW1	2	10-20	20	7/17/2000	Active	7
Sub-area 6B	B28MW1	2	2-12	12	10/25/1988	Active	9
	B28MW2	2	2-12	12	11/7/1988	Active	7
	B28MW3	2	2-12	12	11/7/1988	Active	6
	MW3	2	9.7-19.7	19.7	7/19/2000	Active	9
	MW7	2	6.9-11.9	14.4	7/19/2000	Active	9
	MW9D	2	62.5-72.5	72.5	9/22/2000	Active	9
	MW9S	2	8.0-18.0	73.5	9/18/2000	Active	9
	MW3A	2	5.0-20.0	20	6/10/2002	Active	3
	MW3B	2	5.0-20.0	20	6/10/2002	Active	3
	B28MW-16	2	2-12	12	11/8/1988	Closed	9
	B28MW-1A	2	3.3-13.3	13.3	10/24/1988	Closed	9
	B28MW-15	2	2-12	12	11/8/1988	Closed	3
	B28MW4	2	10.6-15.6	15.6	8/1/1988	Active	3
Sub-area 6C	B25MW4	2	10.6-15.6	15.6	8/1/1988	Active	8
	MW5	2	7.9-17.9	19.9	7/18/2000	Active	4
	MW5AD	2	68.4-78.4	78.5	9/25/2000	Active	9
	MW5AS	2	5.0-15.0	16.5	9/21/2000	Active	9
	MW5BS	2	6.15-16.15	16.5	11/22/2000	Active	9
	MW5CS	2	7.64-17.64	18.1	11/22/2000	Active	9
	MW5DS	2	7.08-17.08	17.5	11/22/2000	Active	10
	MW8	2	9.5-19.5	20	7/18/2000	Active	9
	MW8AD	2	70.5-80.5	81	9/21/2000	Active	9
	MW8AS	2	6.5-16.5	16.5	9/21/2000	Active	9
	B25MW1	2	10.7-15.7	15.7	8/1/1988	Active	7
	B25MW2	2	10.5-15.5	15.5	8/1/1988	Active	NA
	B25MW3	2	NA	60	NA	Closed	NA
Sub-area 6D	MW6	2	8.0-23.0	23	7/19/2000	Active	9
	MW6D	2	68.0-78.0	78	9/23/2000	Active	9

Notes:
NA: No information available
ft bgs: Feet below ground surface
ft: Feet

Table 7-4
Soil Samples Used in Average Concentration Calculations in Area 6: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sub-area	Volatile Organic Compounds		Total Petroleum Hydrocarbons		Polynuclear Aromatic Hydrocarbons		Polychlorinated Biphenyls		Metals	
	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker
6A		B29E1-17			MW-1-16					B21S1-12
		MW-1-16								B29E1-17
										MW-1-16
6B	B22N1-4	B22N1-4	B22N1-4	B22N1-4	B22N1-4	B22N1-4		RC2-7	39-1 0-1	39-1 0-1
	B27W1-3	B22W1-6	RC3-5	B22W1-6	RC3-5	B28N1-7			39-1 1-2	39-1 1-2
	39-1 0-1	B27W1-3		B28N1-7	22-1 1-2	MW-7-7			39-2 0-1	39-2 0-1
	39-3 0-1	B27W2-8		MW-7-7		RC2-7			39-2 1-2	39-2 1-2
	22-1 1-2	B27W3-8		RC2-7		RC3-5			39-3 0-1	39-3 0-1
	22-2 0-1	B28N1-7		RC3-5		S31B1 6_2-7			39-3 1-2	39-3 1-2
	HW1-5	B28-N-D				22-1 1-2			22-1 0-1	22-1 0-1
	RC3-5	39-1 0-1							22-1 1-2	22-1 1-2
		39-3 0-1							22-2 0-1	22-2 0-1
		22-1 1-2							22-2 1-2	22-2 1-2
		22-2 0-1							B22N1-4	B22N1-4
		HW1-5							B27W1-3	B22W1-6
		MW-3-12							HW1-5	B27W1-3
		MW-7-7							RC3-5	B27W2-8
		RC1-7							S31B3 1_5-2_5	B27W3-8
		RC2-7								B28E1-6
		RC3-5								B28N1-7
		RC4-10								HW1-5
		RC6-7								MW-3-12
		S31B1 6.2-7								MW-7-7
		S31B1 8-8.5								MW9S-12
		S31B2 5.2-6								RC10-10
										RC1-7
										RC2-7
										RC3-5
										RC4-10
										RC5-9
										RC6-20
										RC6-7
										RC7-16
										RC8-8
										RC9-8
										S31B1 6_2-7
										S31B1 8-8_5
										S31B2 5_2-6
										S31B2 7_5-8_5
										S31B3 1_5-2_5
										S31B3 6_5-8_5
6C	B20E1-6	B20E1-6	B20E1-6	B20E1-6	B27I4-5	B27E2-12			B27E15-8	B27E10-12
	B27E1-9	B27E1-9	B20E2-8	B20E2-8	B27I9-9	B27I4-5			B27E1-9	B27E15-8
	B27I12-8	B27E4-12	B27I10-9	B27E2-12		B27I9-9			B27E7-10	B27E1-9
	B27I4-5	B27I1-12	B27I11-9	B27I10-9					B27E9-10	B27E2-12
	B27I7-3	B27I12-8	B27I9-9	B27I1-12					B27I4-5	B27E3-12
	B27I9-9	B27I2-11		B27I11-9					B27I6-8	B27E4-12
		B27I3-12		B27I9-9					B27I7-3	B27E5-14
		B27I4-5							B27I9-9	B27E6-12
		B27I7-14							B27S1-5	B27E7-10
		B27I7-3							B27S2-8	B27E8-11
		B27I8-15								B27E9-10
		B27I9-9								B27I1-12
		MW-5-12								B27I2-11
		MW-8-14								B27I3-12
										B27I4-5
										B27I5-14
										B27I6-8
										B27I7-3
										B27I8-15
										B27I9-9
										B27S1-5
										B27S2-8
										MW-5-12
										MW-8-14
										MW8AS-12
6D	B27E12-7	B27E12-7	B27E16-7	B27E16-7					SEWER-5	MW-6-13
	B27E14-6	B27E14-6							SEWER-8	MW6D-12
		MW-6-13								SEWER-5
										SEWER-8

Table 7A-5(a)
Soil Constituents Average Conentrations for VOCs
in Sub-area 6A: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)		
	ACETONE	METHYL ETHYL KETONE (MEK)	METHYLENE CHLORIDE
Non- Residential Worker			
B29AW1-8	12.5	12.5	13
Average Concentration - Only Samples With VOC Detections			
Construction Worker			
B29AW1-8	12.5	12.5	13
B29E1-17	**20**	**11**	3.2
B29I1-17	21	13	3.2
MW-1-16	**41**	**24**	3.6
Average Concentration - Only Samples With VOC Detections	**30.5**	**17.5**	

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 8 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
VOCs - Volatile Organic Compounds
NA - Not Analyzed
No VOCs except acetone and/or methylene chloride detected in the sample
Bold indicates a detection

Table 7A-5(b)
Soil Constituents Average Concentrations for Metals in Sub-area 6A:
GKN Facility Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)					
	ARSENIC	BARIUM	CHROMIUM	LEAD	MERCURY	SELENIUM
B21S1-12	3,100	68,300	12,400	8,100	15	320
B29E1-17	9,500	213,000	20,300	11,200	26	320
MW-1-16	7,500	77,400	11,900	7,000	14	420
Average Concentration - Only Samples With Metals Detections	**6,700**	**119,567**	**14,867**	**8,767**	**18**	**353**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 8 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 7A-5(c)
Soil Constituents Average
Concentrations for PAHs in Sub-area 6A:
GKN Facility
Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	PAH (ug/kg)
	CHRYSENE
MW-1-16	1,500
Average Concentration - Only Samples With PAH Detections	**1,500**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 8 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
PAH - Polynuclear aromatic hydrocarbon
NA - Not Analyzed

Table 7A-7(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 6A: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)								
	ACETONE	BENZENE	BROMODICHLOROMETHANE	CARBON DISULFIDE	CHLOROFORM	CIS-1,2-DICHLOROETHENE	DIBROMOCHLOROMETHANE	METHYLENE CHLORIDE	TRICHLOROETHENE
B21S1W	5	0.5	0.5	**0.52**	0.5	NA	0.5	0.5	0.5
B29AW1W	5	0.5	0.5	0.5	0.5	NA	0.5	0.4	0.5
B29E1W	4.6	0.5	0.5	0.5	0.5	NA	0.5	0.5	0.5
B29I1W	5	0.5	**0.6**	0.5	**1.7**	NA	**0.37**	**0.77**	**2.1**
MW1W	21.36	**1.29**	0.68	1.50	2.32	**0.76**	1.50	2.32	0.68
Average Concentration - Only Samples With VOC Detections	**10.45**	**0.76**	**0.59**	**0.84**	**1.51**	**0.76**	**0.79**	**1.20**	**1.09**

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed
No VOCs except acetone and/or methylene chloride detected in the sample

Table 7B-5(a)
Soil Constituents Average Concentrations for VOCs in Sub-area 6B: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)														
	1,1-DICHLOROETHANE	1,1-DICHLOROETHENE	1,2-DICHLOROETHENE (TOTAL)	ACETONE	CIS-1,2-DICHLOROETHENE	ETHYLBENZENE	METHYL ETHYL KETONE (MEK)	METHYLENE CHLORIDE	TETRACHLOROETHENE	TOLUENE	TRANS-1,2-DICHLOROETHENE	TRANS-1,2-DICHLOROBENZENE	TRICHLOROETHENE	VINYL CHLORIDE	XYLENES, TOTAL
Non- Residential Worker															
B22N1-4	2.95	2.95	2.95	**72**	NA	2.95	12	2.95	**6.2**	2.95	NA	NA	2.95	2.95	2.95
B27W1-3	3.2	3.2	NA	**26**	1.6	**11**	12.5	3.2	3.2	**16**	1.6	NA	3.2	3.2	**64**
39-1 0-1	NA	ND	NA	ND	ND	5	NA	ND	ND	**51**	NA	NA	ND	ND	5
39-3 0-1	NA	ND	NA	ND	ND	3.4	NA	ND	**0.29**	3.4	NA	**36**	0.062	ND	3.5
22-1 1-2	NA	ND	NA	ND	ND	ND	NA	ND	**15**	ND	NA	NA	ND	ND	ND
22-2 0-1	NA	ND	NA	ND	ND	ND	NA	ND	**10**	ND	NA	NA	ND	ND	ND
HW1-5	3.15	3.15	**55**	**16**	NA	3.15	12.5	**13**	**43**	3.15	NA	NA	**9**	**18**	3.15
RC3-5	3.95	3.95	**240**	**200**	NA	3.95	16	**31**	3.95	3.95	NA	NA	**120**	3.95	3.95
Average Concentration - Only Samples With VOC Detections				**78.50**	**74.89**	**4.91**		**12.54**	**11.66**	**13.41**		**36.00**	**27.04**	**7.03**	**13.76**
Construction Worker															
B22E1-8	3.25	3.25	3.25	**20**	NA	3.25	13	14	3.25	3.25	NA	NA	3.25	3.25	3.25
B22S2-8	3.2	3.2	3.2	**18**	NA	3.2	13	3.2	3.2	3.2	NA	NA	3.2	3.2	3.2
B22E3-8	3.2	3.2	3.2	**39**	NA	3.2	13	3.2	3.2	3.2	NA	NA	3.2	3.2	3.2
B22N1-4	2.95	2.95	2.95	**72**	NA	2.95	12	2.95	**6.2**	2.95	NA	NA	2.95	2.95	2.95
B22W1-6	3.15	3.15	3.15	**21**	NA	3.15	**25**	**13**	3.15	3.15	NA	NA	3.15	3.15	3.15
B27W1-3	3.2	3.2	NA	**26**	1.6	**11**	12.5	3.2	3.2	**16**	1.6	NA	3.2	3.2	**64**
B27W2-8	3.25	3.25	NA	13	1.65	3.25	13	3.25	**9.3**	3.25	1.65	NA	3.25	3.25	3.25
B27W3-8	3.15	**7.5**	NA	**40**	**1,800**	3.15	12.5	3.15	3.15	**71**	**160**	NA	**390**	**600**	**15**
B28E1-8	3.2	3.2	3.2	**21**	NA	3.2	13	3.2	3.2	3.2	NA	NA	3.2	3.2	3.2
B28N1-7	3.2	3.2	3.2	**24**	NA	**30**	13	3.2	3.2	3.2	NA	NA	3.2	3.2	3.2
B28-N-D (14-16)	NA	ND	NA	ND	ND	**2,000**	NA	ND	ND	**83,000**	NA	ND	ND	ND	7500
39-1 0-1	NA	ND	NA	ND	ND	5	NA	ND	ND	**51**	NA	ND	ND	ND	5
39-3 0-1	NA	ND	NA	ND	ND	3.4	NA	ND	**0.29**	3.4	NA	**36**	0.062	ND	3.5
22-1 1-2	NA	ND	NA	ND	ND	ND	NA	ND	**15**	ND	NA	ND	ND	ND	ND
22-2 0-1	NA	ND	NA	ND	ND	ND	NA	ND	**10**	ND	NA	ND	ND	ND	ND
HW1-5	3.15	3.15	**55**	**16**	NA	3.15	12.5	**13**	**43**	3.15	NA	NA	**9**	**18**	3.15
MW-3-12	3.15	3.15	**250**	12.5	NA	3.15	12.5	3.15	3.15	3.15	NA	NA	**1.9**	3.15	3.15
MW-7-7	3.15	3.15	3.15	12.5	NA	3.15	**15**	3.15	3.15	3.15	NA	NA	3.15	3.15	3.15
MW95-12	3.2	3.2	NA	13	1.6	3.2	13	**11**	3.2	3.2	1.6	NA	3.2	3.2	3.2
RC10-10	3.1	3.1	NA	12.5	1.55	3.1	12.5	**6.2**	3.1	3.1	1.55	NA	3.1	3.1	3.1
RC11-15	2.5	2.5	2.5	5	2.5	2.5	5	**8**	2.5	2.5	2.5	NA	2.5	5	2.5
RC12-15	2.5	2.5	2.5	5	2.5	2.5	5	**5**	2.5	2.5	2.5	NA	2.5	5	2.5
RC1-7	3.25	3.25	**58**	**23**	NA	3.25	13	3.25	3.25	3.25	NA	NA	**3.9**	**51**	3.25
RC2-7	**1.6**	3.2	3.2	**20**	NA	3.2	13	**15**	3.2	3.2	NA	NA	3.2	**4.7**	3.2
RC3-5	3.95	3.95	**240**	**200**	NA	3.95	16	**31**	3.95	3.95	NA	NA	**120**	3.95	3.95
RC4-10	3.15	3.15	NA	12.5	9.1	3.15	12.5	3.15	3.15	3.15	1.6	NA	24	3.15	3.15
RC5-9	3.2	3.2	NA	**26**	1.6	3.2	13	3.2	3.2	3.2	1.6	NA	3.2	3.2	3.2
RC8-20	3.05	3.05	NA	**26**	1.55	3.05	12	3.05	3.05	3.05	1.55	NA	3.05	3.05	3.05
RC6-7	3.15	3.15	NA	12.5	**44**	3.15	12.5	3.15	3.15	3.15	1.6	NA	**58**	**28**	3.15
RC9-8	3.2	3.2	NA	13	1.6	3.2	13	**8.1**	3.2	3.2	1.6	NA	3.2	3.2	3.2
S31B1 6.2-7	NA	NA	NA	6.5	3.2	NA	NA	NA	**8**	NA	3.2	NA	NA	NA	3.2
S31B1 8-8.5	NA	NA	NA	7	3.4	NA	NA	NA	**28**	NA	3.4	NA	NA	NA	3.4
S31B2 5.2-6	NA	NA	NA	6	3.1	NA	NA	NA	**9.4**	NA	3.1	NA	NA	NA	3.1
S31B3 1.5-2.5	NA	NA	NA	**14**	3.2	NA	NA	NA	3.2	NA	3.2	NA	NA	NA	3.2
Average Concentration - Only Samples With VOC Detections	**3.10**	**3.53**		**30.85**	**146.16**	**122.83**	**13.93**	**7.40**	**8.24**	**4,892.95**	**22.02**	**36.00**	**41.93**	**52.20**	**381.80**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 5 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
VOCs - Volatile Organic Compounds
NA - Not Analyzed
ND - Not Detected
No VOCs except acetone and/or methylene chloride detected in the sample
Bold indicates a detection

Table 7B-5(b)
Soil Constitutents Average Concentrations for TPHs in Sub-area 6B:
GKN Facility, Non-residential Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B22N1-4	RC3-5	Overall Area Average (ug/kg)
TPH - DRO			
7/19/2000	NA	NA	
7/24/2000	15,000	NA	
7/25/2000	NA	20,000	
7/26/2000	NA	NA	
AVERAGE TPH - DRO	15,000	20,000	17,500
TPH - GRO			
7/19/2000	NA	NA	
7/24/2000	1,400	NA	
7/25/2000	NA	220	
7/26/2000	NA	NA	
AVERAGE TPH - GRO	1,400	220	810
TPH - ORO			
None			
AVERAGE TPH - ORO			

Notes:
Groundwater table is at a depth of 5 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 7B-5(b)
Soil Constitutents Average Concentrations for TPHs in Sub-area 6B: GKN Facility, Construction Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B22N1-4	B22W1-6	B28N1-7	MW-7-7	RC2-7	RC3-5	Overall Area Average (ug/kg)
TPH - DRO							
7/19/2000	NA	NA	NA	15,500	NA	NA	
7/24/2000	15,000	16,000	NA	NA	NA	NA	
7/25/2000	NA	NA	NA	NA	**980,000**	20,000	
7/26/2000	NA	NA	16,000	NA	NA	NA	
AVERAGE TPH - DRO	15,000	16,000	16,000	15,500	980,000	20,000	177,083
TPH - GRO							
7/19/2000	NA	NA	NA	**660**	NA	NA	
7/24/2000	**1,400**	**270**	NA	NA	NA	NA	
7/25/2000	NA	NA	NA	NA	65	**220**	
7/26/2000	NA	NA	**16,000**	NA	NA	NA	
AVERAGE TPH - GRO	1,400	270	16,000	660	65	220	3,103
TPH - ORO							
None							
AVERAGE TPH - ORO							

Notes:
Groundwater table is at a depth of 5 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 7B-5(c)
Soil Constituents Average Concentrations for Metals in Sub-area 6B: GKN Facility Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)																				
	ALUMINUM	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CALCIUM	CHROMIUM	COBALT	COPPER	IRON	LEAD	MAGNESIUM	MANGANESE	MERCURY	NICKEL	POTASSIUM	SELENIUM	SODIUM	VANADIUM	ZINC
39-1 0-1	8,770,000	4,310	21,100	74,100	822	550	26,800,000	15,200	5,200	15,200	22,100,000	20,000	14,900,000	230,000	25	15,700	775,000	3,660	342,000	33,100	46,200
39-1 1-2	8,230,000	7,940	28,200	306,000	997	2,520	23,700,000	16,900	10,100	21,900	42,400,000	27,900	14,300,000	2,520,000	22	31,900	690,000	5,650	311,000	42,200	52,300
39-2 0-1	3,930,000	2,040	8,950	53,100	451	244	90,100,000	22,700	5,230	17,000	8,650,000	12,000	4,750,000	141,000	2	26,200	613,000	1,545	320,000	20,000	45,500
39-2 1-2	8,690,000	2,400	23,600	66,000	781	244	42,200,000	13,700	5,470	13,300	11,600,000	19,800	22,000,000	240,000	29	12,600	922,000	1,545	303,000	29,200	38,900
39-3 0-1	8,950,000	2,400	20,000	66,000	781	244	42,200,000	13,700	5,470	13,300	11,600,000	19,800	22,000,000	240,000	29	12,600	922,000	1,545	303,000	29,200	38,900
39-3 1-2	9,430,000	3,500	21,400	104,000	869	244	24,300,000	15,500	6,050	14,000	15,800,000	20,900	13,100,000	540,000	24	17,900	852,000	1,545	296,000	33,200	46,300
22-1 0-1	12,700,000	5,510	37,000	199,000	1,340	1,060	7,600,000	20,000	14,000	28,100	21,100,000	32,700	3,810,000	4,310,000	49	62,300	1,000,000	3,570	1,510,000	47,700	67,500
22-1 1-2	10,400,000	3,520	40,100	200,000	1,140	244	9,320,000	17,800	15,100	25,500	19,300,000	26,500	6,100,000	1,540,000	32	49,400	687,000	1,545	801,000	45,200	60,300
22-2 0-1	11,500,000	4,090	31,700	168,000	1,120	244	5,310,000	21,200	8,420	17,200	17,500,000	26,100	3,740,000	771,000	53	28,400	897,000	1,545	1,410,000	38,000	58,300
22-2 1-2	10,200,000	3,770	34,500	158,000	1,130	244	11,100,000	18,700	8,200	27,200	15,700,000	25,700	7,200,000	300,000	39	24,500	696,000	1,545	484,000	45,200	67,200
B22N1-4	NA	NA	3,000	84,000	NA	295	NA	11,300	NA	NA	NA	6,100	NA	NA	29	NA	NA	295	NA	NA	NA
B27W1-3	NA	NA	130,000	152,000	NA	810	NA	13,700	NA	NA	NA	7,500	NA	NA	65	NA	NA	320	NA	NA	NA
HW1-5	NA	NA	4,400	142,000	NA	315	NA	14,000	NA	NA	NA	8,100	NA	NA	32	NA	NA	315	NA	NA	NA
RC3-5	NA	NA	4,350	97,400	NA	370	NA	14,050	NA	NA	NA	8,100	NA	NA	25	NA	NA	370	NA	NA	NA
S31B3 1_5-2_5	NA	NA	8,800	190,000	NA	315	NA	15,000	NA	NA	NA	13,000	NA	NA	60	NA	NA	315	NA	NA	NA
Average Concentration - Only Samples With Metals Detections	9,280,000	3,964	27,007	137,333	937	582.6	28,271,000	16,283	8,404	19,350	18,575,000	18,333	11,190,000	1,084,100	34	28,150	813,400	1,687	608,000	36,300	52,140

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 5 feet below ground surface (bgs) for area.
Non Residential Worker - shows groundwater table in the area
Construction Worker - shows a depth of 20 feet bgs
NA - Not Analyzed

Table 7B-5(c)
Soil Constituents Average Concentrations for Metals in Sub-area 6B: GKN Facility Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)																				
	ALUMINUM	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CALCIUM	CHROMIUM	COBALT	COPPER	IRON	LEAD	MAGNESIUM	MANGANESE	MERCURY	NICKEL	POTASSIUM	SELENIUM	SODIUM	VANADIUM	ZINC
39-1 0-1	8,770,000	4,310	21,100	74,100	822	550	26,800,000	15,200	5,300	15,200	22,100,000	20,800	14,900,000	230,000	25	15,700	775,000	3,660	343,000	33,100	46,200
39-1 1-2	8,230,000	7,940	28,200	306,000	997	2,520	23,700,000	16,900	10,100	21,900	42,400,000	27,900	14,300,000	2,520,000	22	31,900	690,000	5,650	311,000	42,200	52,300
39-2 0-1	3,930,000	2,040	8,950	53,100	451	244	90,100,000	22,700	5,230	17,800	8,650,000	12,800	4,750,000	141,000	2	26,200	613,000	1,545	320,000	28,000	45,500
39-2 1-2	8,690,000	2,400	23,600	66,000	781	244	42,200,000	13,700	5,470	13,300	11,600,000	19,800	22,000,000	240,000	29	12,600	922,000	1,545	303,000	29,200	38,900
39-3 0-1	8,950,000	2,400	28,000	66,000	781	244	42,200,000	13,700	5,470	13,300	11,600,000	19,800	22,000,000	240,000	29	12,600	922,000	1,545	303,000	29,200	38,900
39-3 1-2	9,430,000	3,500	21,400	104,000	869	244	24,300,000	15,500	6,050	14,000	15,800,000	20,900	13,100,000	549,000	24	17,900	852,000	1,545	296,000	33,200	46,300
22-1 0-1	12,700,000	5,510	37,000	199,000	1,340	1,860	7,600,000	20,800	14,800	28,100	21,100,000	32,700	3,910,000	4,310,000	49	62,300	1,000,000	3,570	1,510,000	47,700	67,500
22-1 1-2	10,400,000	3,520	48,100	200,000	1,140	244	9,320,000	17,800	15,100	25,500	19,300,000	26,500	6,100,000	1,540,000	32	49,400	687,000	1,545	891,000	45,200	60,300
22-2 0-1	11,500,000	4,050	31,700	168,000	1,120	244	5,310,000	21,200	8,420	17,200	17,500,000	26,100	3,740,000	771,000	53	28,400	897,000	1,545	1,410,000	38,000	58,300
22-2 1-2	10,200,000	3,770	34,500	158,000	1,130	244	11,100,000	18,700	8,200	27,200	15,700,000	25,700	7,200,000	300,000	39	24,500	696,000	1,545	484,000	45,200	67,200
B22N1-4	NA	NA	3,000	84,000	NA	295	NA	11,300	NA	NA	NA	6,100	NA	NA	29	NA	NA	295	NA	NA	NA
B22W1-6	NA	NA	1,100	70,300	NA	315	NA	13,100	NA	NA	NA	8,200	NA	NA	32	NA	NA	315	NA	NA	NA
B27W1-3	NA	NA	136,000	152,000	NA	810	NA	13,700	NA	NA	NA	7,500	NA	NA	65	NA	NA	320	NA	NA	NA
B27W2-8	NA	NA	5,000	187,000	NA	1,100	NA	13,200	NA	NA	NA	8,000	NA	NA	65	NA	NA	325	NA	NA	NA
B27W3-8	NA	NA	13,500	123,000	NA	750	NA	11,800	NA	NA	NA	7,300	NA	NA	65	NA	NA	315	NA	NA	NA
B28E1-6	NA	NA	3,000	82,600	NA	320	NA	10,500	NA	NA	NA	7,100	NA	NA	22	NA	NA	320	NA	NA	NA
B28N1-7	NA	NA	6,100	118,000	NA	320	NA	13,000	NA	NA	NA	8,000	NA	NA	38	NA	NA	320	NA	NA	NA
HW1-5	NA	NA	4,400	142,000	NA	315	NA	14,000	NA	NA	NA	8,100	NA	NA	32	NA	NA	315	NA	NA	NA
MW-3-12	NA	NA	9,000	103,000	NA	315	NA	21,000	NA	NA	NA	9,200	NA	NA	21	NA	NA	660	NA	NA	NA
MW-7-7	NA	NA	5,500	137,000	NA	315	NA	13,500	NA	NA	NA	7,400	NA	NA	22	NA	NA	315	NA	NA	NA
MW9S-12	NA	NA	5,200	117,000	NA	320	NA	17,700	NA	NA	NA	6,500	NA	NA	65	NA	NA	320	NA	NA	NA
RC10-10	NA	NA	2,500	81,000	NA	310	NA	10,600	NA	NA	NA	8,800	NA	NA	60	NA	NA	310	NA	NA	NA
RC1-7	NA	NA	8,800	188,000	NA	140	NA	20,000	NA	NA	NA	11,500	NA	NA	15	NA	NA	325	NA	NA	NA
RC2-7	NA	NA	4,700	98,100	NA	320	NA	19,500	NA	NA	NA	7,700	NA	NA	21	NA	NA	320	NA	NA	NA
RC3-5	NA	NA	4,350	97,400	NA	370	NA	14,050	NA	NA	NA	8,100	NA	NA	25	NA	NA	370	NA	NA	NA
RC4-10	NA	NA	9,700	124,000	NA	1,100	NA	12,700	NA	NA	NA	8,500	NA	NA	65	NA	NA	315	NA	NA	NA
RC5-9	NA	NA	6,000	97,500	NA	320	NA	12,600	NA	NA	NA	8,600	NA	NA	65	NA	NA	320	NA	NA	NA
RC6-20	NA	NA	2,900	128,000	NA	305	NA	13,900	NA	NA	NA	10,600	NA	NA	60	NA	NA	305	NA	NA	NA
RC6-7	NA	NA	6,300	94,600	NA	315	NA	16,300	NA	NA	NA	6,500	NA	NA	65	NA	NA	315	NA	NA	NA
RC7-16	NA	NA	2,200	104,000	NA	310	NA	19,000	NA	NA	NA	6,000	NA	NA	60	NA	NA	310	NA	NA	NA
RC8-8	NA	NA	3,300	97,400	NA	730	NA	16,500	NA	NA	NA	6,400	NA	NA	65	NA	NA	320	NA	NA	NA
RC9-8	NA	NA	9,700	114,000	NA	320	NA	16,300	NA	NA	NA	7,600	NA	NA	65	NA	NA	320	NA	NA	NA
S31B1 6_2-7	NA	NA	3,150	100,000	NA	320	NA	11,000	NA	NA	NA	9,200	NA	NA	50	NA	NA	315	NA	NA	NA
S31B1 8-8_5	NA	NA	3,350	97,000	NA	340	NA	31,000	NA	NA	NA	14,000	NA	NA	40	NA	NA	335	NA	NA	NA
S31B2 5_2-6	NA	NA	6,600	140,000	NA	310	NA	12,000	NA	NA	NA	11,000	NA	NA	40	NA	NA	2,300	NA	NA	NA
S31B2 7_5-8_5	NA	NA	3,250	96,000	NA	320	NA	12,000	NA	NA	NA	6,000	NA	NA	50	NA	NA	325	NA	NA	NA
S31B3 1_5-2_5	NA	NA	8,000	190,000	NA	315	NA	15,000	NA	NA	NA	13,000	NA	NA	60	NA	NA	315	NA	NA	NA
S31B3 6_5-8_5	NA	NA	3,350	140,000	NA	335	NA	12,000	NA	NA	NA	7,900	NA	NA	50	NA	NA	335	NA	NA	NA
Average Concentration - Only Samples With Metals Detections	9,280,000	3,964	14,266	125,724	937	481.3	28,271,000	15,617	8,404	19,350	18,575,000	12,347	11,190,000	1,084,100	42	28,150	813,400	920	608,000	36,300	52,140

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 5 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ND - Not Detected
NA - Not Analyzed

Table 7B-5(d)
Soil Constituents Average Concentrations for PAHs in Sub-area B: GKN Facility
Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	PAHs (ug/kg)								
	ACENAPHTHENE	ACENAPHTHYLENE	BENZO(A)ANTHRACENE	BENZO(B)FLUORANTHENE	CHRYSENE	FLUORANTHENE	FLUORENE	PHENANTHRENE	PYRENE
B22N1-4	6800	74	42	42	300	110	62	18	18
22-1 1-2	ND	ND	ND	ND	ND	520	ND	ND	500
RC3-5	22	22	11.25	11.25	85	22	22	22	22
Average Concentration - Only Samples With PAH Detections	**3,411**	**48**	**26.63**	**26.63**	**192.50**	**217.33**	**42**		**180**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 5 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
PAH - Polynuclear aromatic hydrocarbon
NA - Not Analyzed

Table 7B-5(d)
Soil Constituents Average Concentrations for PAHs in Sub-area B: GKN Facility
Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	PAHs (ug/kg)								
	ACENAPHTHENE	ACENAPHTHYLENE	BENZO(A)ANTHRACENE	BENZO(B)FLUORANTHENE	CHRYSENE	FLUORANTHENE	FLUORENE	PHENANTHRENE	PYRENE
B22N1-4	6,800	74	42	42	300	110	62	18	18
B28N1-7	19.5	19.5	9.5	9.5	110	19.5	19.5	19.5	19.5
22-1 1-2	ND	ND	ND	ND	ND	520	ND	ND	500
MW-7-7	19	19	9.5	9.5	210	19	19	19	19
RC2-7	19	19	29	9.5	9.5	19	19	19	19
RC3-5	22	22	11.25	11.25	85	22	22	22	22
S31B1 6_2-7	21.25	21.25	2.125	2.125	2.125	2.125	21.25	5.07	2.125
Average Concentration - Only Samples With PAH Detections	**1,150.13**	**29.13**	**17.23**	**13.98**	**119.44**	**101.66**	**27.13**	**17.1**	**85.66**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 5 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
PAH - Polynuclear aromatic hydrocarbon
NA - Not Analyzed

Table 7B-5(e)
Soil Constituents Average
Concentrations for PCBs in Sub-area 6B:
GKN Facility
Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	PCB (ug/kg)
	AROCLOR 1254
RC2-7	100
Average Concentration - Only Samples With PCB Detections	**100**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 5 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
PCB - Polychlorinated Byphenyls
NA - Not Analyzed

Table 7B-7(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 6B: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)																																	
	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	1,1-DICHLOROETHANE	1,1-DICHLOROETHENE	1,2,3-TRIMETHYLBENZENE	1,2,4-TRIMETHYLBENZENE	1,2-DICHLOROBENZENE	1,2-DICHLOROETHENE (TOTAL)	1,2-DICHLOROPROPANE	1,3-DICHLOROBENZENE	1,4-DICHLOROBENZENE	ACETONE	BENZENE	BROMODICHLOROMETHANE	BROMOMETHANE	CARBON DISULFIDE	CHLOROETHANE	CHLOROFORM	CIS-1,2-DICHLOROETHENE	DICHLORODIFLUOROMETHANE	ETHYLBENZENE	ISOPROPYL BENZENE	METHYL ETHYL KETONE (MEK)	METHYL TERT-BUTYL ETHER	METHYLENE CHLORIDE	N-PROPYLBENZENE	SEC-BUTYLBENZENE	TERT-BUTYLBENZENE	TETRACHLOROETHENE	TOLUENE	TRANS-1,2-DICHLOROETHENE	TRICHLOROETHENE	TRICHLOROFLUOROMETHANE	VINYL CHLORIDE	XYLENES, TOTAL
B22E2W	NA	0.5	0.5	NA	NA	NA	0.5	0.5	NA	NA	5	0.5	0.5	1	0.5	1	0.5	NA	NA	0.5	NA	2.5	NA	0.5	NA	NA	NA	0.5	0.5	NA	0.5	NA	1	0.5
B22E3W	NA	0.5	0.5	NA	NA	NA	0.5	0.5	NA	NA	5	0.5	0.5	1	0.5	1	0.5	NA	NA	0.5	NA	2.5	NA	0.5	NA	NA	NA	0.5	0.38	NA	0.5	NA	1	0.5
B22N1W	NA	0.5	0.5	NA	NA	NA	0.5	0.5	NA	NA	11	0.5	0.5	1	0.51	1	0.5	NA	NA	0.5	NA	2.5	NA	0.38	NA	NA	NA	0.5	0.5	NA	0.5	NA	1	0.5
B22W1W	NA	0.5	0.5	NA	NA	NA	3.6	0.5	NA	NA	5	0.5	0.5	1	0.5	1	0.5	NA	NA	0.5	NA	2.5	NA	0.5	NA	NA	NA	0.5	0.5	NA	2.2	NA	1	0.5
B27W1W	NA	2.5	2.5	NA	NA	NA	NA	2.5	NA	NA	20	2.5	2.5	5	2.5	5	2.5	1.25	NA	2.5	NA	10	NA	2.5	NA	NA	NA	2.5	2.5	14	2.5	NA	110	2.5
B27W2W	NA	2.5	2.5	NA	NA	NA	NA	2.5	NA	NA	21	2.5	2.5	5	2.5	5	2.5	13	NA	2.5	NA	10	NA	2.5	NA	NA	NA	39	2.5	1.25	20	NA	2.5	2.5
B27W3DW	0.50	13.34	13.20	0.50	15.88	15.88	NA	13.20	15.88	15.88	632.00	13.20	13.20	13.70	2.50	13.70	63.50	1014.25	15.88	13.20	15.88	632.00	15.88	63.50	15.88	15.88	15.88	13.20	63.50	70.45	13.20	15.88	113.50	38.60
B27W3SW	NA	12	13	NA	NA	NA	NA	2.5	NA	NA	10	7.3	2.5	5	2.5	5	2.5	7200	NA	2.5	NA	10	NA	2.5	NA	NA	NA	2.5	41	410	510	NA	2600	2.5
B28E1W	NA	0.5	0.5	NA	NA	NA	0.5	0.5	NA	NA	5	0.5	0.5	1	0.5	1	0.5	NA	NA	0.5	NA	2.5	NA	0.39	NA	NA	NA	0.5	0.37	NA	0.5	NA	1	0.5
B28MW1W	0.50	1.66	1.56	0.50	1.09	114.04	NA	1.11	1.45	12.67	39.43	1.16	1.20	1.46	2.50	1.46	6.51	155.29	1.19	1.14	1.00	36.57	2.55	4.11	1.00	1.00	1.00	40.61	3.82	15.88	11.62	3.99	99.57	2.61
B28MW2W	36.00	1.00	1.00	0.50	0.79	0.79	NA	1.00	0.79	0.79	22.00	1.00	1.00	4.44	2.50	1.63	2.50	0.84	1.44	1.06	0.79	20.63	1.14	2.50	0.79	0.79	0.79	1.00	2.25	0.84	1.00	1.14	1.31	1.75
B28MW3W	0.50	0.89	0.79	0.50	0.50	0.50	NA	0.79	0.50	0.50	24.43	0.79	0.79	1.14	2.50	1.14	2.50	1.95	0.50	0.86	0.50	22.86	0.50	2.50	0.50	0.50	0.50	0.79	2.21	0.61	2.43	0.50	0.79	1.64
B28MW4W	7000.00	0.50	0.50	3.10	2.40	0.50	NA	0.50	0.50	0.50	25.00	136.67	0.50	0.50	NA	0.50	2.50	25.00	350.25	3.53	3.95	25.00	310.33	2.50	2.10	0.50	0.50	6.05	19.00	305.00	1.00	0.50	31.50	10.37
B28N1W	NA	25	25	NA	NA	NA	1900	25	NA	NA	250	44	25	50	25	50	25	NA	NA	25	NA	125	NA	43	NA	NA	NA	25	25	NA	25	NA	260	25
HW1W	NA	6	0.71	NA	NA	NA	180	6	NA	NA	60	6	6	12.5	6	12.5	6	NA	NA	6	NA	31	NA	6	NA	NA	NA	260	0.48	NA	37	NA	38	6
MW3AW	0.50	1.25	1.09	0.50	1.00	1.00	NA	1.00	1.00	1.00	50.00	1.00	1.00	1.00	NA	1.00	5.00	272.31	1.00	1.00	1.00	50.00	1.00	5.00	1.00	1.00	1.00	1.00	5.00	13.37	207.69	1.00	6.92	3.00
MW3BW	0.50	0.54	0.54	0.50	0.54	0.54	NA	0.85	0.54	0.54	26.92	0.54	0.54	0.54	NA	0.54	2.69	45.92	0.54	0.54	0.54	26.92	0.54	2.69	0.54	0.54	0.54	0.54	2.69	1.26	1.32	0.54	7.48	1.62
MW3W	3.40	12.94	17.56	0.50	13.13	13.13	NA	12.12	13.13	13.13	598.60	12.12	12.12	12.26	1.08	12.26	59.74	3344.00	13.24	12.16	13.13	598.88	13.24	70.55	13.13	13.13	13.13	12.12	43.74	73.35	1874.24	13.24	626.92	36.08
MW7W	0.50	0.67	0.67	0.50	0.68	0.68	NA	0.67	0.68	0.68	21.67	0.67	0.67	0.92	1.50	0.92	2.33	0.37	0.91	0.71	0.68	21.46	0.91	2.35	0.68	0.85	0.77	0.67	2.17	0.68	0.70	0.91	0.92	1.50
RC10W	NA	2.5	2.5	NA	NA	NA	NA	2.5	NA	NA	10	2.5	2.5	5	2.5	5	2.5	11	NA	2.5	NA	10	NA	2.5	NA	NA	NA	2.5	2.5	1.25	38	NA	2.5	2.5
RC1W	NA	3.8	5	NA	NA	NA	120	5	NA	NA	50	5	5	10	5	10	5	NA	NA	5	NA	25	NA	4.8	NA	NA	NA	5	5	NA	80	NA	20	5
RC2W	NA	17	0.5	NA	NA	NA	34	0.5	NA	NA	7.1	0.85	0.5	1	0.5	1	0.5	NA	NA	0.77	NA	2.5	NA	1.1	NA	NA	NA	0.5	3.8	NA	0.5	NA	21	2.2
RC3W	NA	0.5	0.31	NA	NA	NA	225	0.5	NA	NA	5	0.5	0.5	1	0.5	1	0.5	NA	NA	0.5	NA	2.5	NA	0.47	NA	NA	NA	0.5	0.48	NA	1.535	NA	16.5	0.5
RC4W	NA	2.5	2.5	NA	NA	NA	NA	2.5	NA	NA	10	2.5	2.5	5	2.5	5	2.5	9.9	NA	2.5	NA	10	NA	2.5	NA	NA	NA	2.5	2.5	1.25	49	NA	13	2.5
RC6DW	0.50	1.32	0.90	0.50	0.50	0.50	NA	0.90	0.50	0.50	28.80	0.90	0.90	1.40	2.50	1.54	2.50	5.64	0.50	0.90	0.50	22.00	0.50	2.50	0.50	0.50	0.50	0.90	2.50	1.55	0.90	0.50	3.18	1.70
RC6SW	NA	2.5	2.5	NA	NA	NA	NA	2.5	NA	NA	21	2.5	2.5	5	2.5	5	2.5	120	NA	2.5	NA	10	NA	2.5	NA	NA	NA	2.5	2.5	9.1	120	NA	59	2.5
RC7W	NA	2.5	2.5	NA	NA	NA	NA	2.5	NA	NA	20	2.5	2.5	5	2.5	5	2.5	1.25	NA	2.5	NA	10	NA	2.5	NA	NA	NA	2.5	2.5	1.25	2.5	NA	2.5	2.5
RC8DW	0.50	0.90	0.90	0.50	0.50	0.50	NA	0.90	0.50	0.50	22.00	0.90	0.90	1.40	2.50	1.40	2.50	14.60	0.50	0.90	0.50	22.00	0.50	3.54	0.50	0.50	0.50	0.90	2.50	0.79	7.04	0.50	0.90	1.70
RC8SW	NA	125	125	NA	NA	NA	NA	125	NA	NA	500	125	125	250	125	250	125	1600	NA	125	NA	500	NA	125	NA	NA	NA	125	125	130	125	NA	125	125
RC9W	NA	2.5	2.5	NA	NA	NA	NA	2.5	NA	NA	74	2.5	2.5	5	2.5	5	2.5	1.25	NA	2.5	NA	10	NA	2.5	NA	NA	NA	2.5	2.5	1.25	2.5	NA	2.5	2.5
Average Concentration - Only Samples With VOC Detections	640.31	8.55	7.97	0.74	3.38	13.46		7.58	3.22	4.24	88.71	13.31	7.58	14.22	7.88	14.13	11.85	582.14	35.09	7.71	3.50	79.96	31.55	12.84	3.33	3.20	3.19	19.56	13.02	58.37	111.85	3.52	148.77	10.06

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed
No VOCs except acetone detected in the sample

Table 7C-5(a)
Soil Constituents Average Conentrations for VOCs in Sub-area 6C: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)											
	1,2-DICHLOROETHENE (TOTAL)	ACETONE	CHLOROFORM	CIS-1,2-DICHLOROETHENE	DICHLORODIFLUOROMETHANE	ETHYLBENZENE	METHYL ETHYL KETONE (MEK)	METHYL ISOBUTYL KETONE	METHYLENE CHLORIDE	O-XYLENE	TRICHLOROETHENE	XYLENES, TOTAL
Non- Residential Worker												
B20E1-6	NA	NA	NA	NA	NA	**3,200**	NA	NA	NA	**1,200**	NA	**1,200**
B27E1-9	**2.4**	12.5	3.15	NA	NA	3.15	12.5	12.5	3.15	NA	**11**	3.15
B27E7-10	NA	12.5	3.1	1.55	NA	3.1	12.5	12.5	6.3	NA	3.1	3.1
B27E9-10	NA	13	3.2	1.6	NA	3.2	13	13	6.3	NA	3.2	3.2
B27I12-8	NA	NA	0.5	0.5	**3.6**	25	NA	NA	0.5	0.5	0.5	25
B27I4-5	3.1	**82**	3.1	NA	NA	3.1	**18**	12.5	3.1	NA	3.1	3.1
B27I7-3	3.3	13.5	3.3	NA	NA	3.3	**8.9**	13.5	3.3	NA	3.3	3.3
B27I9-9	3.2	**110**	3.2	NA	NA	3.2	13	**6.7**	3.2	NA	3.2	3.2
Average Concentration - Only Samples With VOC Detections		**54.5**		**2.5**	**3.6**	**539.63**	**13.1**	**11.3**		**600.25**	**4.22**	**206.292**
Construction Worker												
B20E1-6	NA	NA	NA	NA	NA	**3,200**	NA	NA	NA	**1,200**	NA	**1,200**
B27E1-9	**2.4**	12.5	3.15	NA	NA	3.15	12.5	12.5	3.15	NA	**11**	3.15
B27E4-12	NA	12.5	3.1	**7**	NA	3.1	12.5	12.5	3.1	NA	**37**	3.1
B27E7-10	NA	12.5	3.1	1.55	NA	3.1	12.5	12.5	6.3	NA	3.1	3.1
B27E8-11	NA	13	3.3	1.65	NA	3.3	13	13	6.7	NA	3.3	3.3
B27E9-10	NA	13	3.2	1.6	NA	3.2	13	13	6.3	NA	3.2	3.2
B27I1-12	**6.1**	13	**2.1**	NA	NA	3.25	**12**	13	3.25	NA	**290**	3.25
B27I12-8	NA	NA	0.5	0.5	**3.6**	25	NA	NA	0.5	0.5	0.5	25
B27I2-11	3.35	13.5	3.35	NA	NA	3.35	**14**	13.5	3.35	NA	**4.4**	3.35
B27I3-12	3.2	13	3.2	NA	NA	3.2	**11**	13	3.2	NA	**5.5**	3.2
B27I4-5	3.1	**82**	3.1	NA	NA	3.1	**18**	12.5	3.1	NA	3.1	3.1
B27I6-6	3.45	**25**	3.45	NA	NA	3.45	14	14	3.45	NA	3.45	3.45
B27I7-14	3.05	12	3.05	NA	NA	3.05	**12**	12	3.05	NA	3.05	3.05
B27I7-3	3.3	13.5	3.3	NA	NA	3.3	**8.9**	13.5	3.3	NA	3.3	3.3
B27I8-15	3.3	13.5	3.3	NA	NA	3.3	**6.7**	13.5	3.3	NA	3.3	3.3
B27I9-9	3.2	**110**	3.2	NA	NA	3.2	13	**6.7**	3.2	NA	3.2	3.2
MW-5-12	3.2	13	3.2	NA	NA	3.2	13	13	3.2	NA	**15**	3.2
MW-8-14	3.35	13.5	3.35	NA	NA	3.35	**15**	13.5	3.35	NA	3.35	3.35
Average Concentration - Only Samples With VOC Detections		**26.83**	**2.92**	**3.47**	**3.60**	**233.11**	**12.38**	**12.43**		**600.25**	**29.44**	**90.25**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 10 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
VOCs - Volatile Organic Compounds
NA - Not Analyzed
No VOCs except methylene chloride detected in the sample
Bold indicates a detection

Table 7C-5(b)
Soil Constitutents Average Concentrations for TPHs in Sub-area 6C:
GKN Facility, Non-residential Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B20E1-6	B20E2-8	B27I10-9	B27I11-9	B27I9-9	Overall Area Average (ug/kg)
TPH - DRO						TPH - DRO
7/18/2000	NA	NA	NA	NA	NA	
7/19/2000	**170,000**	**490,000**	NA	NA	NA	
7/20/2000	NA	NA	NA	NA	NA	
7/21/2000	NA	NA	NA	NA	NA	
7/25/2000	NA	NA	NA	NA	**1,400,000**	
11/14/2000	NA	NA	**650,000**	**120,000**	NA	
7/22/2003	NA	NA	NA	NA	NA	
7/25/2003	NA	NA	NA	NA	NA	
AVERAGE TPH - DRO	170,000	490,000	650,000	120,000	1,400,000	566,000
TPH - GRO						TPH - GRO
7/18/2000	NA	NA	NA	NA	NA	
7/19/2000	65	**320,000**	NA	NA	NA	
7/20/2000	NA	NA	NA	NA	NA	
7/21/2000	NA	NA	NA	NA	NA	
7/25/2000	NA	NA	NA	NA	65	
11/14/2000	NA	NA	65	65	NA	
7/22/2003	NA	NA	NA	NA	NA	
7/25/2003	NA	NA	NA	NA	NA	
AVERAGE TPH - GRO	65	320,000	65	65	65	64,052
TPH - ORO						TPH - ORO
7/22/2003	NA	NA	NA	NA	NA	
7/25/2003	NA	NA	NA	NA	NA	
AVERAGE TPH - ORO						

Notes:
Groundwater table is at a depth of 10 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon

DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 7C-5(b)
Soil Constitutents Average Concentrations for TPHs in Sub-area 6C: GKN Facility, Construction Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B20E1-6	B20E2-8	B27E2-12	B27I10-9	B27I1-12	B27I11-9	B27I9-9	Overall Area Average (ug/kg)
TPH - DRO								TPH - DRO
7/18/2000	NA	NA	NA	NA	NA	NA	NA	
7/19/2000	**170,000**	**490,000**	**4,500,000**	NA	NA	NA	NA	
7/20/2000	NA	NA	NA	NA	NA	NA	NA	
7/21/2000	NA	NA	NA	NA	**16,000**	NA	NA	
7/25/2000	NA	NA	NA	NA	NA	NA	**1,400,000**	
11/14/2000	NA	NA	NA	**650,000**	NA	**120,000**	NA	
7/22/2003	NA	NA	NA	NA	NA	NA	NA	
7/25/2003	NA	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - DRO	170,000	490,000	4,500,000	650,000	16,000	120,000	1,400,000	1,049,429
TPH - GRO								TPH - GRO
7/18/2000	NA	NA	NA	NA	NA	NA	NA	
7/19/2000	**65**	**320,000**	**240**	NA	NA	NA	NA	
7/20/2000	NA	NA	NA	NA	NA	NA	NA	
7/21/2000	NA	NA	NA	NA	**150**	NA	NA	
7/25/2000	NA	NA	NA	NA	NA	NA	**65**	
11/14/2000	NA	NA	NA	**65**	NA	**65**	NA	
7/22/2003	NA	NA	NA	NA	NA	NA	NA	
7/25/2003	NA	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - GRO	65	320,000	240	65	150	65	65	45,807
TPH - ORO								TPH - ORO
7/22/2003	NA	NA	NA	NA	NA	NA	NA	
7/25/2003	NA	NA	NA	NA	NA	NA	NA	
AVERAGE TPH - ORO								

Notes:

Groundwater table is at a depth of 10 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon

DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 7C-5(c)
Soil Constituents Average Concentrations for Metals in Sub-area 6C: GKN Facility
Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)						
	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	MERCURY	SELENIUM
B27E15-8	NA	NA	NA	10,000	NA	NA	NA
B27E1-9	7,200	164,000	290	69,800	14,100	47	315
B27E7-10	2,800	75,700	310	9,300	7,300	60	310
B27E9-10	5,900	163,000	740	13,400	12,600	65	320
B27I4-5	4,400	233,000	310	13,200	8,700	19	310
B27I6-8	10,850	166,000	330	93,650	13,400	27	330
B27I7-3	7,700	293,000	330	18,000	12,200	17	530
B27I9-9	6,500	189,000	320	17,600	14,000	20	320
B27S1-5	2,200	75,400	320	10,700	6,400	11	320
B27S2-8	7,000	108,000	320	16,000	10,500	29	320
Average Concentration - Only Samples With Metals Detections	**6,061**	**163,011**	**363.3**	**27,165**	**11,022**	**33**	**342**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 10 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 7C-5(c)
Soil Constituents Average Concentrations for Metals in Sub-area 6C: GKN Facility
Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)						
	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	MERCURY	SELENIUM
B27E10-12	2,700	91,800	325	11,800	7,600	65	325
B27E15-8	NA	NA	NA	10,000	NA	NA	NA
B27E1-9	7,200	164,000	290	69,800	14,100	47	315
B27E2-12	9,400	176,000	1,200	17,200	10,400	25	315
B27E3-12	2,700	101,000	315	11,800	9,200	65	315
B27E4-12	1,500	64,800	310	13,700	7,000	60	310
B27E5-14	4,400	103,000	740	10,900	10,600	60	310
B27E6-12	4,600	85,100	320	13,300	7,600	65	320
B27E7-10	2,800	75,700	310	9,300	7,300	60	310
B27E8-11	4,200	146,000	660	13,700	8,000	65	330
B27E9-10	5,900	163,000	740	13,400	12,600	65	320
B27I1-12	5,500	152,000	76	13,400	9,100	19	325
B27I2-11	3,700	71,600	335	14,400	6,800	21	335
B27I3-12	7,700	142,000	98	17,500	9,700	26	320
B27I4-5	4,400	233,000	310	13,200	8,700	19	310
B27I5-14	5,400	122,000	310	17,900	12,800	30	310
B27I6-8	10,850	166,000	330	93,650	13,400	27	330
B27I7-3	7,700	293,000	330	18,000	12,200	17	530
B27I8-15	8,500	295,000	180	18,700	11,700	21	330
B27I9-9	6,500	189,000	320	17,600	14,000	20	320
B27S1-5	2,200	75,400	320	10,700	6,400	11	320
B27S2-8	7,000	108,000	320	16,000	10,500	29	320
MW-5-12	8,200	84,400	320	14,500	8,600	16	320
MW-8-14	5,800	107,000	335	18,100	11,900	18	335
MW8AS-12	10,750	303,500	1,395	16,400	9,800	65	322.5
Average Concentration - Only Samples With Metals Detections	**5,817**	**146,346**	**424.5**	**19,798**	**10,000**	**38**	**329**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 10 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 7C-5(d)
Soil Constituents Average Concentrations for PAHs in
Sub-area 6C: GKN Facility Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	PAHs (ug/kg)			
	BENZO(A)ANTHRACENE	BENZO(B)FLUORANTHENE	CHRYSENE	FLUORANTHENE
B27I4-5	9.5	9.5	72	18.5
B27I9-9	95	95	740	190
Average Concentration - Only Samples With PAH Detections			**406**	

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 10 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
PAH - Polynuclear aromatic hydrocarbon
NA - Not Analyzed

Table 7C-5(d)
Soil Constituents Average Concentrations for PAHs in
Sub-area 6C: GKN Facility Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	PAHs (ug/kg)			
	BENZO(A)ANTHRACENE	BENZO(B)FLUORANTHENE	CHRYSENE	FLUORANTHENE
B27E2-12	94	39	9.5	44
B27I4-5	9.5	9.5	72	18.5
B27I9-9	95	95	740	190
Average Concentration - Only Samples With PAH Detections	**66.17**	**47.83**	**273.83**	**84.17**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 10 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
PAH - Polynuclear aromatic hydrocarbon
NA - Not Analyzed

Table 7D-5(a)
Soil Constituents Average Conentrations for VOCs
in Sub-area 6D: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)		
	DICHLORODIFLUOROMETHANE	METHYL ETHYL KETONE (MEK)	TOLUENE
Non- Residential Worker			
B27E12-7	8.4	NA	25
B27E14-6	2.5	125	52
Average Concentration - Only Samples With VOC Detections	**5.45**		**38.5**
Construction Worker			
B27E12-7	8.4	NA	25
B27E14-6	2.5	125	52
MW-6-13	NA	12	3.2
Average Concentration - Only Samples With VOC Detections	**5.45**	**68.5**	**26.73**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 9 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
VOCs - Volatile Organic Compounds
NA - Not Analyzed
Bold indicates a detection

Table 7D-5(b)
Soil Constitutents Average Concentrations for TPHs in
Sub-area 6D: GKN Facility
Non-Residential Worker and
Construction Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B27E16-7	Overall Area Average (ug/kg)
TPH - DRO		TPH - DRO
7/19/2000	NA	
7/2/2003	2,500	
7/25/2003	NA	
AVERAGE TPH - DRO	2,500	2,500
TPH - GRO		TPH - GRO
7/19/2000	NA	
7/2/2003	**12,000**	
7/25/2003	NA	
AVERAGE TPH - GRO	12,000	12,000
TPH - ORO		TPH - ORO
7/2/2003	2,500	
7/25/2003	NA	
AVERAGE TPH - ORO	2,500	2,500

Notes:
Groundwater table is at a depth of 9 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 7D-5(c)
Soil Constituents Average Concentrations for Metals in Sub-area 6D:
GKN Facility Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)					
	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	MERCURY
SEWER-5	5,800	174,000	305	11,000	14,400	60
SEWER-8	4,500	123,000	740	21,000	10,200	65
Average Concentration - Only Samples With Metals Detections	5,150	148,500	522.5	16,000	12,300	

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 9 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 7D-5(c)
Soil Constituents Average Concentrations for Metals in Sub-area 6D:
GKN Facility Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)					
	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	MERCURY
MW-6-13	17,700	195,000	120	15,000	8,400	21
MW6D-12	9,000	143,000	760	14,300	27,700	65
SEWER-5	5,800	174,000	305	11,000	14,400	60
SEWER-8	4,500	123,000	740	21,000	10,200	65
Average Concentration - Only Samples With Metals Detections	9,250	158,750	481.3	15,325	15,175	53

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 9 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 7-6
Groundwater Samples Used in Average Concentration Calculations in Area 6: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sub-area	Volatile Organic Compounds	Total Petroleum Hydrocarbons	Polynuclear Aromatic Hydrocarbons	Polychlorinated Biphenyls	Metals
6A	B21S1W	B29E1W			B21S1W
	B29I1W				MW1W
	MW1W				
6B	B22E2W	B22E3W	B22N1W	RC1W	B22E2W
	B22E3W	B22N1W	RC2W	RC2W	B22E3W
	B22N1W	B28MW1W			B22N1W
	B22W1W	B28MW3W			B22W1W
	B27W1W	B28MW4W			B27W1W
	B27W2W	B28N1W			B27W2W
	B27W3DW	HW1W			B27W3DW
	B27W3SW	MW3W			B27W3SW
	B28E1W	RC1W			B28E1W
	B28MW1W	RC2W			B28MW1W
	B28MW2W	RC3W			B28MW2W
	B28MW3W				B28MW3W
	B28MW4W				B28N1W
	B28N1W				RC10W
	HW1W				RC1W
	MW3AW				RC2W
	MW3BW				RC3W
	MW3W				RC4W
	MW7W				RC5W
	RC10W				RC6DW
	RC1W				RC6SW
	RC2W				RC7W
	RC3W				HW1W
	RC4W				MW3W
	RC6DW				MW7W
	RC6SW				MW9SW
	RC8DW				RC8SW
	RC8SW				RC9W
					RR5W

Table 7-6
Groundwater Samples Used in Average Concentration Calculations in Area 6: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sub-area	Volatile Organic Compounds	Total Petroleum Hydrocarbons	Polynuclear Aromatic Hydrocarbons	Polychlorinated Biphenyls	Metals
6C	B27E1W	B25MW1W			B25MW1W
	B27E2W	B25MW4W			B25MW4W
	B27E4W	B27E1W			B27E10W
	B27I12W	B27E2W			B27E11W
	B27I1W	B27I10W			B27E15W
	B27I2W	B27I11W			B27E1W
	B27I5W	B27I1W			B27E2W
	B27I6W	B27I2W			B27E3W
	B27I7W	B27I6W			B27E4W
	B27I8W	B27I7W			B27E5W
	B27I9W	B27I9W			B27E6W
	B27S2W	MW5ASW			B27E7W
	B27S3W	MW5CSW			B27E8W
	MW5ASW				B27E9W
	MW5W				B27I1W
	MW5W				B27I2W
	MW8ASW				B27I5W
	MW8W				B27I6W
					B27I7W
					B27I8W
					B27I9W
					B27S1W
					B27S2W
					B27S3W
					MW5ASW
					MW5BSW
					MW5CSW
					MW5DSW
					MW5W
					MW8ASW
					MW8W
6D	B27E12W				MW6W
	B27E16W				SEWERW
	MW6W				

Table 7A-7(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 6A: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)								
	ACETONE	BENZENE	BROMODICHLOROMETHANE	CARBON DISULFIDE	CHLOROFORM	CIS-1,2-DICHLOROETHENE	DIBROMOCHLOROMETHANE	METHYLENE CHLORIDE	TRICHLOROETHENE
B21S1W	5	0.5	0.5	0.52	0.5	NA	0.5	0.5	0.5
B29AW1W	5	0.5	0.5	0.5	0.5	NA	0.5	0.4	0.5
B29E1W	4.6	0.5	0.5	0.5	0.5	NA	0.5	0.5	0.5
B29I1W	5	0.5	0.6	0.5	1.7	NA	0.37	0.77	2.1
MW1W	21.36	1.29	0.68	1.50	2.32	0.76	1.50	2.32	0.68
Average Concentration - Only Samples With VOC Detections	**10.45**	**0.76**	**0.59**	**0.84**	**1.51**	**0.76**	**0.79**	**1.20**	**1.09**

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed
No VOCs except acetone and/or methylene chloride detected in the sample

Table 7A-7(b)
Groundwater Constitutents Average Concentrations for TPHs in Sub-area 6A:
GKN Facility
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B29E1W	Overall Area Average (ug/l)
TPH-DRO		**TPH-DRO**
7/21/2000	250	
7/26/2000	NA	
7/27/2000	NA	
AVERAGE	250	**250**
TPH-GRO		**TPH-GRO**
7/25/2000	730	
7/26/2000	NA	
7/27/2000	NA	
AVERAGE	730	**730**
TPH-ORO		**TPH-ORO**
None		
AVERAGE		

Notes:
ug/l - micrograms per liter
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 7A-7(c)
Groundwater Constituents Average Concentrations for Metals in Sub-area 6A:
GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/l)						
	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	MERCURY	SELENIUM
B21S1W	**196**	**22900**	**13.4**	**1060**	**388**	**1.3**	**7**
MW1W	**7.39**	**233.63**	1.69	**17**	**8.25**	**0.2719**	26.25
Average Concentration - Only Samples With Metals Detections	**102**	**11,567**	**7.54**	**539**	**198**	**0.79**	**16.63**

Notes:
ug/l - micrograms per liter
NA - Not Analyzed
Bold indicates a detection

Table 7B-7(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 6B: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)																																
	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	1,1-DICHLOROETHANE	1,1-DICHLOROETHENE	1,2,3-TRIMETHYLBENZENE	1,2,4-TRIMETHYLBENZENE	1,2-DICHLOROBENZENE	1,2-DICHLOROETHENE (TOTAL)	1,2-DICHLOROPROPANE	1,3-DICHLOROBENZENE	1,4-DICHLOROBENZENE	ACETONE	BENZENE	BROMODICHLOROMETHANE	BROMOMETHANE	CARBON DISULFIDE	CHLOROETHANE	CHLOROFORM	CIS-1,2-DICHLOROETHENE	DICHLORODIFLUOROMETHANE	ETHYLBENZENE	ISOPROPYL BENZENE	METHYL ETHYL KETONE (MEK)	METHYL TERT-BUTYL ETHER	METHYLENE CHLORIDE	N-PROPYLBENZENE	SEC-BUTYLBENZENE	TERT-BUTYLBENZENE	TETRACHLOROETHENE	TOLUENE	TRANS-1,2-DICHLOROETHENE	TRICHLOROETHENE	TRICHLOROFLUOROMETHANE	VINYL CHLORIDE	XYLENES, TOTAL
B22E2W	NA	0.5	0.5	NA	NA	NA	0.5	0.5	NA	NA	5	0.5	0.5	1	0.5	1	0.5	NA	NA	0.5	NA	2.5	NA	0.5	NA	NA	NA	0.5	0.5	NA	0.5	NA	1	0.5
B22E3W	NA	0.5	0.5	NA	NA	NA	0.5	0.5	NA	NA	5	0.5	0.5	1	0.5	1	0.5	NA	NA	0.5	NA	2.5	NA	0.5	NA	NA	NA	0.5	0.38	NA	0.5	NA	1	0.5
B22N1W	NA	0.5	0.5	NA	NA	NA	0.5	0.5	NA	NA	11	0.5	0.5	1	0.51	1	0.5	NA	NA	0.5	NA	2.5	NA	0.38	NA	NA	NA	0.5	0.5	NA	0.5	NA	1	0.5
B22W1W	NA	0.5	0.5	NA	NA	NA	3.6	0.5	NA	NA	5	0.5	0.5	1	0.5	1	0.5	NA	NA	0.5	NA	2.5	NA	0.5	NA	NA	NA	0.5	0.5	NA	2.2	NA	1	0.5
B27W1W	NA	2.5	2.5	NA	NA	NA	NA	2.5	NA	NA	20	2.5	2.5	5	2.5	5	2.5	1.25	NA	2.5	NA	10	NA	2.5	NA	NA	NA	2.5	2.5	14	2.5	NA	110	2.5
B27W2W	NA	2.5	2.5	NA	NA	NA	NA	2.5	NA	NA	21	2.5	2.5	5	2.5	5	2.5	13	NA	2.5	NA	10	NA	2.5	NA	NA	NA	39	2.5	1.25	20	NA	2.5	2.5
B27W3DW	0.50	13.34	13.20	0.50	15.88	15.88	NA	13.20	15.88	15.88	632.00	13.20	13.20	13.70	2.50	13.70	63.50	1014.25	15.88	13.20	15.88	632.00	15.88	63.50	15.88	15.88	15.88	13.20	63.50	70.46	13.20	15.88	113.50	38.60
B27W3SW	NA	12	13	NA	NA	NA	NA	2.5	NA	NA	10	7.5	2.5	5	2.5	5	2.5	7200	NA	2.5	NA	10	NA	2.5	NA	NA	NA	2.5	41	410	510	NA	2900	2.5
B28E1W	NA	0.5	0.5	NA	NA	NA	0.5	0.5	NA	NA	6	0.5	0.5	1	0.5	1	0.5	NA	NA	0.5	NA	2.5	NA	0.38	NA	NA	NA	0.5	0.37	NA	0.5	NA	1	0.5
B28MW1W	0.50	1.66	1.58	0.50	1.09	114.04	NA	1.11	1.45	12.67	38.43	1.16	1.20	1.46	2.50	1.46	6.51	155.29	1.19	1.14	1.00	38.57	2.55	4.11	1.00	1.00	1.00	40.61	3.82	15.88	11.82	3.99	89.57	2.61
B28MW2W	36.00	1.00	1.00	0.50	0.79	0.79	NA	1.00	0.79	0.79	22.00	1.00	1.00	4.44	2.50	1.69	2.50	0.84	1.44	1.06	0.79	20.69	1.14	2.50	0.79	0.79	0.79	1.00	2.25	0.84	1.00	1.14	1.31	1.75
B28MW3W	0.50	0.89	0.79	0.50	0.50	0.50	NA	0.79	0.50	0.50	24.43	0.79	0.79	1.14	2.50	1.14	2.50	1.95	0.50	0.86	0.50	22.86	0.50	2.50	0.50	0.50	0.50	0.79	2.21	0.61	2.43	0.50	0.79	1.84
B28MW4W	7000.00	0.50	0.50	3.10	2.40	0.50	NA	0.50	0.50	0.50	25.00	136.67	0.50	0.50	NA	0.50	2.50	26.00	350.25	3.53	3.95	25.00	310.33	2.50	2.10	0.50	0.50	6.05	19.00	305.00	1.00	0.50	31.50	10.37
B28N1W	NA	25	25	NA	NA	NA	1900	25	NA	NA	250	44	25	50	25	50	25	NA	NA	25	NA	125	NA	43	NA	NA	NA	25	25	NA	25	NA	260	25
HW1W	NA	6	0.71	NA	NA	NA	180	6	NA	NA	60	6	6	12.5	6	12.5	6	NA	NA	6	NA	31	NA	6	NA	NA	NA	260	0.48	NA	37	NA	38	6
MW3AW	0.50	1.26	1.09	0.50	1.00	1.00	NA	1.00	1.00	1.00	50.00	1.00	1.00	1.00	NA	1.00	5.00	272.31	1.00	1.00	1.00	50.00	1.00	5.00	1.00	1.00	1.00	1.00	5.00	13.37	207.69	1.00	6.92	3.00
MW3BW	0.50	0.54	0.54	0.50	0.54	0.54	NA	0.85	0.54	0.54	26.92	0.54	0.54	0.54	NA	0.54	2.69	45.92	0.54	0.54	0.54	26.92	0.54	2.69	0.54	0.54	0.54	0.54	2.69	1.26	1.32	0.54	7.49	1.62
MW3W	3.40	12.94	17.56	0.50	13.13	13.13	NA	12.12	13.13	13.13	598.60	12.12	12.12	12.26	1.09	12.26	59.74	3344.60	13.24	12.16	13.13	598.89	13.24	70.56	13.13	13.13	13.13	12.12	43.74	73.35	1674.24	13.24	626.92	36.06
MW7W	0.50	0.67	0.67	0.50	0.68	0.68	NA	0.67	0.68	0.68	21.67	0.67	0.67	0.92	1.50	0.92	2.33	6.37	0.91	0.71	0.68	21.46	0.91	2.36	0.68	0.65	0.77	0.67	2.17	0.68	6.70	0.91	0.92	1.50
RC10W	NA	2.5	2.5	NA	NA	NA	NA	2.5	NA	NA	10	2.5	2.5	5	2.5	5	2.5	11	NA	2.5	NA	10	NA	2.5	NA	NA	NA	2.5	2.5	1.25	38	NA	2.5	2.5
RC1W	NA	3.8	5	NA	NA	NA	120	5	NA	NA	50	5	5	10	5	10	5	NA	NA	5	NA	25	NA	4.8	NA	NA	NA	5	5	NA	80	NA	20	5
RC2W	NA	17	0.5	NA	NA	NA	34	0.5	NA	NA	7.1	0.85	0.5	1	0.5	1	0.5	NA	NA	0.77	NA	2.5	NA	1.1	NA	NA	NA	0.5	3.6	NA	0.5	NA	21	2.2
RC3W	NA	0.5	0.31	NA	NA	NA	225	0.5	NA	NA	5	0.5	0.5	1	0.5	1	0.5	NA	NA	0.5	NA	2.5	NA	0.47	NA	NA	NA	0.5	0.46	NA	1.535	NA	16.5	0.5
RC4W	NA	2.5	2.5	NA	NA	NA	NA	2.5	NA	NA	10	2.5	2.5	5	2.5	5	2.5	9.9	NA	2.5	NA	10	NA	2.5	NA	NA	NA	2.5	2.5	1.25	49	NA	13	2.5
RC6DW	0.50	1.32	0.90	0.50	0.50	0.50	NA	0.90	0.50	0.50	28.60	0.90	0.90	1.40	2.50	1.54	2.50	5.64	0.50	0.90	0.50	22.00	0.50	2.50	0.50	0.50	0.50	0.90	2.50	1.55	0.90	0.50	3.18	1.70
RC6SW	NA	2.5	2.5	NA	NA	NA	NA	2.5	NA	NA	21	2.5	2.5	5	2.5	5	2.5	120	NA	2.5	NA	10	NA	2.5	NA	NA	NA	2.5	2.5	9.1	120	NA	69	2.5
RC7W	NA	2.5	2.5	NA	NA	NA	NA	2.5	NA	NA	23	2.5	2.5	5	2.5	5	2.5	1.25	NA	2.5	NA	10	NA	2.5	NA	NA	NA	2.5	2.5	1.25	2.5	NA	2.5	2.5
RC8DW	0.50	0.90	0.90	0.50	0.50	0.50	NA	0.90	0.50	0.50	22.00	0.90	0.90	1.40	2.50	1.40	2.50	14.60	0.50	0.90	0.50	22.00	0.50	3.54	0.50	0.50	0.50	0.90	2.50	0.79	7.04	0.50	0.90	1.70
RC8SW	NA	125	125	NA	NA	NA	NA	125	NA	NA	500	125	125	250	125	250	125	1600	NA	125	NA	500	NA	125	NA	NA	NA	125	125	130	125	NA	125	125
RC9W	NA	2.5	2.5	NA	NA	NA	NA	2.5	NA	NA	74	2.5	2.5	5	2.5	5	2.5	1.25	NA	2.5	NA	10	NA	2.5	NA	NA	NA	2.5	2.5	1.25	2.5	NA	2.5	2.5
Average Concentration - Only Samples With VOC Detections	640.31	8.55	7.97	0.74	3.36	13.46		7.58	3.22	4.34	98.71	13.31	7.58	14.22	7.88	14.13	11.85	882.14	35.09	7.71	3.50	79.96	31.55	12.84	3.33	3.20	3.19	19.56	13.02	58.37	111.86	3.52	148.77	10.06

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed
No VOCs except acetone detected in the sample

Table 7B-7(b)
Groundwater Constitutents Average Concentrations for TPHs in Sub-area 6B: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B22E3W	B22N1W	B28MW1W	B28MW3W	B28MW4W	B28N1W	HW1W	MW3W	RC1W	RC2W	RC2W - 2004	RC3W	Overall Area Average (ug/l)
TPH-DRO													TPH - DRO
7/24/2000	NA	**2,900**	NA	NA	NA	NA	480	NA	NA	NA	NA	NA	
7/25/2000	600	NA	NA	NA	NA	NA	NA	NA	250	**340,000**	NA	49,000	
7/26/2000	NA	NA	NA	NA	NA	250	NA	NA	NA	NA	NA	NA	
7/28/2000	NA	NA	NA	NA	NA	NA	NA	250	NA	NA	NA	NA	
10/23/2001	NA	NA	**170**	**150**	NA	NA	NA	NA	NA	NA	NA	NA	
3/21/2003	NA	NA	NA	NA	**420**	NA	NA	NA	NA	NA	NA	NA	
6/18/2003	NA	NA	NA	NA	**310**	NA	NA	NA	NA	NA	NA	NA	
4/29/2004	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**7,000**	NA	
AVERAGE	600	2,900	170	150	365	250	480	250	250	340,000	7,000	49,000	33,451
TPH-GRO													TPH - GRO
7/24/2000	NA	**3,600**	NA	NA	NA	NA	**180**	NA	NA	NA	NA	NA	
7/25/2000	**130**	NA	NA	NA	NA	NA	NA	NA	**130**	**2,100**	NA	**140**	
7/26/2000	NA	NA	NA	NA	NA	**1,000**	NA	NA	NA	NA	NA	NA	
7/28/2000	NA	NA	NA	NA	NA	NA	NA	**1,700**	NA	NA	NA	NA	
3/21/2003	NA	NA	NA	NA	**460**	NA	NA	NA	NA	NA	NA	NA	
6/18/2003	NA	NA	NA	NA	**1,000**	NA	NA	NA	NA	NA	NA	NA	
4/29/2004	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	250	NA	
AVERAGE	130	3600			730	1000	180	1700	130	2100	250	140	996
TPH-ORO													TPH - ORO
3/21/2003	NA	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	
6/18/2003	NA	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	
4/29/2004	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	250	NA	
AVERAGE					50						250		150

Notes:
ug/l - micrograms per liter
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 7B-7(c)
Groundwater Constituents Average Concentrations for Metals in Sub-area 6B: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/l)								
	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	MERCURY	SELENIUM	SILVER	MANGANESE
B22E2W	577	57,000.0	2.5	2,170.0	684	1.8	2.5	5	NA
B22E3W	453	13,100.0	2.5	2,390.0	802	2.2	2.5	5	NA
B22N1W	70.9	5,770.0	14.9	426.0	542	0.42	36.4	1.2	NA
B22W1W	47.5	23,400.0	23.4	2,560.0	1,180	2.1	2.5	5	NA
B27W1W	27.6	397.0	2500	72.9	27.6	0.84	2.5	5	NA
B27W2W	84.2	7,660.0	2500	336.0	95.2	0.51	2.5	5	NA
B27W3DW	5	553.0	2500	5.0	1.5	0.1	2.5	5	NA
B27W3SW	109	2,070.0	2500	250.0	97	0.25	7.2	5	NA
B28E1W	82.8	1,620.0	2.5	301.0	105	0.43	2.5	5	NA
B28MW1W	18.07	730.0	419.8	24.4	21.65	0.13	27.5	7.5	NA
B28MW2W	47.18	500.8	509.06	26.1	79.24	0.1	26.25	7.5	NA
B28MW3W	27.14	2,203.3	370.53	76.5	112.64	19.19	2.5	5	NA
B28N1W	23.2	637.0	2.5	54.6	19.2	0.077	2.5	5	NA
HW1W	499	19,000.0	2.5	906.0	798	2	32.6	5	NA
MW3W	14.27	615.2	1.78	35.7	15.24	0.12	18.33	6.67	NA
MW7W	13.18	666.7	2.1	29.28	13.64	0.0956	26.25	7.5	NA
MW9SW	42.55	3,690.9	230.26	105.82	56.13	0.27	51.25	12.5	6,400
RC10W	112	3,280.0	2500	641	267	1.2	2.5	5	NA
RC1W	15.4	589.0	8.6	64.5	19	0.16	2.5	5	NA
RC2W	549	2,100.0	24.2	159	39.8	0.2	2.5	5	NA
RC3W	9.85	928.5	2.5	37.2	12.3	0.075	2.5	5	NA
RC4W	109	2,540.0	2500	490	220	0.61	2.5	5	NA
RC5W	37.9	1,020.0	2500	91.5	31.6	0.1	2.5	5	NA
RC6DW	11	820.0	2500	16.2	34.8	0.1	2.5	5	NA
RC6SW	16.4	841.0	2500	69.8	22.6	0.1	2.5	5	NA
RC7W	61.4	3,160.0	2500	411	124	0.49	2.5	5	NA
RC8SW	5	756.0	2500	25.2	5.9	0.1	2.5	5	NA
RC9W	23.8	488.0	2500	71.2	24.9	0.1	2.5	5	NA
RR5W	37.7	1,630.0	2500	91.1	33.5	0.1	2.5	5	NA
Average Concentration - Only Samples With Metals Detections	108	5,440	1,176.5	412	189	1.17	10	5	6,400

Notes:
ug/l - micrograms per liter
NA - Not Analyzed
Bold indicates a detection

Table 7B-7(d)
Groundwater Constituents Average Concentrations for PAHs in Sub-area 6B:
GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sample ID	PAH (ug/l)		
	ACENAPHTHENE	BENZO(A)ANTHRACENE	CHRYSENE
B22N1W	43	2.5	25
RC2W	25	**250**	**86**
Average Concentration - Only Samples With PAH Detections	**34**	**126.25**	**55.5**

Notes:
ug/l - micrograms per liter
PAH - Polynuclear aromatic hydrocarbon
NA - Not Analyzed
Bold indicates a detection

Table 7B-7(e)
Groundwater Constituents Average Concentrations for PCBs in Sub-area 6B: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sample ID	PCB (ug/l)
	AROCLOR 1254
RC1W	**11**
RC2W	**580**
Average Concentration - Only Samples With PCB Detections	**296**

Notes:
ug/l - micrograms per liter
PCB - Polychlorinated Byphenyls
NA - Not Analyzed
Bold indicates a detection

Table 7C-7(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 6C: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)																			
	1,1,2-TRICHLOROETHANE	1,1-DICHLOROETHENE	1,2-DICHLOROETHENE (TOTAL)	2-HEXANONE (MBK)	ACETONE	BENZENE	BROMODICHLOROMETHANE	CARBON DISULFIDE	CARBON TETRACHLORIDE	CHLOROFORM	CIS-1,2-DICHLOROETHENE	DICHLORODIFLUOROMETHANE	METHYL ETHYL KETONE (MEK)	METHYL ISOBUTYL KETONE	METHYLENE CHLORIDE	TETRACHLOROETHENE	TOLUENE	TRANS-1,2-DICHLOROETHENE	TRICHLOROETHENE	VINYL CHLORIDE
B27E1W	1.3	0.58	740	2.5	5	0.5	0.73	0.5	0.5	2	NA	NA	2.5	2.5	0.5	3.5	0.36	NA	2700	1.1
B27E2W	0.5	0.5	0.5	2.5	5.9	0.5	0.5	0.91	0.5	0.5	NA	NA	2.5	2.5	0.5	0.5	0.5	NA	0.5	1
B27E4W	NA	2.5	NA	NA	NA	2.5	NA	NA	2.5	2.5	190.6	NA	NA	NA	2.5	2.5	2.5	2.5	388.45	2.5
B27I12W	0.5	0.5	NA	NA	NA	1.17	0.5	NA	0.5	0.5	1.55	1.8	NA	NA	0.5	0.5	1.17	0.5	0.5	0.5
B27I1W	0.5	2	290	2.5	5	0.5	0.5	0.5	0.5	0.92	NA	NA	2.5	2.5	0.6	0.5	0.5	NA	620	31
B27I2W	0.5	1.5	290	2.5	5	0.5	0.5	0.5	0.5	0.5	NA	NA	2.5	2.5	0.5	0.5	0.5	NA	200	18
B27I5W	0.5	0.5	0.81	2.5	5	0.5	0.5	0.5	0.5	0.5	NA	NA	2.5	2.5	0.5	0.5	0.5	NA	7.4	1
B27I6W	0.5	0.5	0.51	2.5	5.4	0.24	0.5	0.5	0.5	0.5	NA	NA	2.5	2.5	0.5	0.5	0.5	NA	0.5	16
B27I7W	0.5	0.5	0.5	2.5	5	0.5	0.5	0.5	0.5	0.5	NA	NA	2.5	2.5	0.47	0.5	0.5	NA	0.46	1
B27I8W	0.5	0.5	0.38	2.5	5	0.5	0.5	0.5	0.5	0.5	NA	NA	2.5	2.5	0.6	0.5	0.38	NA	0.25	1
B27I9W	0.5	0.5	0.5	16	34.5	0.5	0.5	2.15	0.5	0.5	NA	NA	14.5	2.6	0.5	0.5	0.5	NA	0.5	1
B27S2W	0.5	0.5	0.5	2.5	5	0.5	0.5	0.5	0.32	0.5	NA	NA	2.5	2.5	0.5	0.5	0.5	NA	0.5	1
B27S3W	0.5	0.5	3.4	2.5	4.4	0.5	0.5	0.5	0.5	0.5	NA	NA	2.5	2.5	0.5	0.5	0.5	NA	0.5	1
MW5ASW	1.05	1.05	NA	7.50	30.91	1.05	1.05	2.50	1.05	3.41	91.64	1.15	30.91	30.91	3.41	1.05	3.23	2.93	104.83	3.07
MW5W	1.30	1.30	NA	4.17	13.00	1.30	1.30	1.83	1.30	2.10	10.48	2.75	12.50	12.50	2.11	1.50	1.70	1.50	49.40	6.98
MW8ASW	0.86	0.86	NA	7.50	21.82	0.99	0.86	2.50	0.86	2.50	0.75	0.95	21.82	21.82	2.50	0.86	2.42	0.75	0.86	1.09
MW8W	0.68	0.68	NA	3.75	21.36	0.78	0.68	1.50	0.68	2.32	3.86	0.95	21.14	21.14	2.32	0.68	2.19	0.70	1.30	0.95
Average Concentration - Only Samples With VOC Detections	0.67	0.88		4.26	11.49	0.77	0.63	1.06	0.72	1.22	95.65	1.52	8.39	7.60	1.12	0.92	1.08	1.48	239.76	5.19

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed

Table [illegible])

Groundwater Constitutents Average Concentrations for TPHs in Sub-area 6C: GKN Facility

Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B25MW1W	B25MW4W	B27E1W	B27E2W	B27E2W - 2004	B27I10W	B27I11W	B27I1W	B27I2W	B27I6W	B27I7W	B27I9W	B27I9W - 2004	MW5ASW	MW5CSW	Overall Area Average (ug/l)
TPH-DRO																TPH - DRO
7/20/2000	NA	NA	NA	11,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/21/2000	NA	NA	250	NA	NA	NA	NA	250	NA	NA	8,500	NA	NA	NA	NA	
7/24/2000	NA	NA	NA	NA	NA	NA	NA	NA	550	NA	NA	NA	NA	NA	NA	
7/25/2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	120,000	NA	NA	NA	
7/26/2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	8,000	NA	NA	NA	NA	NA	
7/27/2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/28/2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
9/20/2000	250	8,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
11/16/2000	NA	NA	NA	NA	NA	25,000	6,800	NA	NA	NA	NA	NA	NA	NA	NA	
1/11/2001	50	583	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
5/7/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
5/9/2001	1,400	60	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/19/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/23/2001	190	1,400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
10/24/2001	200	2,200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
10/25/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
3/11/2002	NA	3,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
5/31/2002	160	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
8/14/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	130	120	
8/16/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
12/10/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	50	
12/11/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
3/13/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
3/14/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	50	
6/24/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	50	
6/25/2003	120	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/22/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/25/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
4/29/2004	NA	NA	NA	NA	1,800	NA	NA	NA	NA	NA	NA	NA	3,200	NA	NA	
AVERAGE	339	2,792	250	11,000	1,800	25,000	6,800	250	550	8,000	8,500	120,000	3,200	70	68	12,575
TPH-GRO																TPH - GRO
7/20/2000	NA	NA	NA	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/21/2000	NA	NA	480	NA	NA	NA	NA	520	NA	NA	50	NA	NA	NA	NA	
7/25/2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	NA	110	NA	NA	NA	
7/26/2000	NA	NA	NA	NA	NA	NA	NA	NA	110	NA	NA	NA	NA	NA	NA	
7/27/2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/28/2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
9/20/2000	50	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
11/16/2000	NA	NA	NA	NA	NA	710	270	NA	NA	NA	NA	NA	NA	NA	NA	
1/11/2001	50	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
6/24/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	50	
6/25/2003	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/22/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/25/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
4/29/2004	NA	NA	NA	NA	250	NA	NA	NA	NA	NA	NA	NA	250	NA	NA	
AVERAGE	50	50	480	50	250	710	270	520	110	50	50	110	250	50	50	203
TPH-ORO																TPH - ORO
1/11/2001	50	3,430	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
6/24/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	50	
6/25/2003	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/22/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/25/2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
4/29/2004	NA	NA	NA	NA	250	NA	NA	NA	NA	NA	NA	NA	2,300	NA	NA	
AVERAGE	50	3,430			250								2,300	50	50	1,022

Notes:

ug/l - micrograms per liter

TPH - Total petroleum hydrocarbon

DRO - Diesel range organic

GRO - Gasoline range organic

ORO - Oil range organic

Bold indicates a detection

NA - Not analyzed

Table 7C-7(c)
Groundwater Constituents Average Concentrations for Metals in Sub-area 6C: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/l)								
	ARSENIC	BARIUM	CADMIUM	CHROMIUM	CHROMIUM,HEXAVALENT	LEAD	MERCURY	SELENIUM	IRON
B25MW1W	**29.18**	**894**	501.6	**94**	NA	**39.1**	**0.192**	26.25	1400
B25MW4W	**118.29**	**2,735.71**	**364.43**	**197.14**	NA	**93.21**	**0.19**	126.25	NA
B27E10W	**45.6**	**2309.5**	1252.5	**191**	NA	**88.25**	**0.275**	**7.7**	NA
B27E11W	**674**	**16900**	2500	**2850**	NA	**1010**	**5.5**	2.5	NA
B27E15W	NA	NA	NA	**13**	NA	NA	NA	NA	NA
B27E1W	5	**421**	**1.6**	**49000**	NA	**24.2**	**0.23**	2.5	NA
B27E2W	**7**	**526**	2.5	**2.2**	NA	**2.3**	0.099	2.5	NA
B27E3W	**49.5**	**1870**	2500	**207**	NA	**80.3**	**2.9**	2.5	NA
B27E4W	5	**492.5**	2500	**13750**	NA	**36.5**	0.1	2.5	NA
B27E5W	**11.8**	**809**	2500	**46.7**	NA	**15.6**	0.1	2.5	NA
B27E6W	**89.6**	**2420**	2500	**258**	NA	**125**	**0.72**	2.5	NA
B27E7W	**283.5**	**7865**	1252.5	**1037.5**	25	**585.75**	**1.1**	6.25	NA
B27E8W	**51.1**	**1590**	1252.5	**196**	NA	**79.25**	**0.295**	6.25	NA
B27E9W	**242.5**	**16855**	1252.5	**1210**	25	**430.5**	**6.15**	6.25	NA
B27I1W	**33.3**	**1250**	**0.41**	**133**	NA	**51.5**	**0.2**	2.5	NA
B27I2W	**15.3**	**538**	**2.4**	**57.2**	NA	**21.9**	**0.035**	2.5	NA
B27I5W	**16.2**	**2500**	**2.2**	**68.8**	NA	**35.4**	**0.15**	2.5	NA
B27I6W	**16.1**	**1020**	2.5	**2650**	NA	**33.2**	**0.087**	2.5	NA
B27I7W	**255**	**5460**	**11.3**	**994**	NA	**327**	**2.6**	2.5	NA
B27I8W	**64.4**	**703**	**5**	**90.9**	NA	**29.4**	**0.15**	**4.1**	NA
B27I9W	**167.5**	**2095**	**1.13**	**96.7**	NA	**47.65**	**0.125**	2.5	NA
B27S1W	**68.2**	**2010**	2.5	**269**	NA	**98.6**	**0.35**	2.5	NA
B27S2W	**93.5**	**1950**	2.5	**290**	NA	**158**	**0.44**	2.5	NA
B27S3W	**28.9**	**1050**	2.5	**7.4**	NA	**3.2**	**0.091**	2.5	NA
MW5ASW	**7.27**	**429.91**	**230.00**	**16.01**	**10.89**	**7.55**	0.10	26.25	**2,170.25**
MW5BSW	6.56	**348.25**	314.44	**11.56**	NA	**8.85**	0.21	26.25	**628.00**
MW5CSW	**7.67**	**617.33**	280.08	**6.20**	NA	**7.50**	0.10	26.25	**1,173.00**
MW5DSW	**7.375**	**405.5**	314.44	**8**	NA	**9.625**	0.1	26.25	**311.5**
MW5W	**16.98**	**335.4**	2.9	**20.02**	5	**16.26**	**0.0924**	34.17	NA
MW8ASW	**9.6**	**339**	501.6	**8.76**	NA	6.8	0.1	26.25	**4430**
MW8W	**11.36**	**484.2**	2.1	**45.66**	NA	**14.34**	**0.14**	26.25	NA
Average Concentration - Only Samples With Metals Detections	**81**	**2,574**	**668.6**	**2,381.48**	**16**	**116**	**0.76**	**13.82**	**1,685.46**

Notes:
ug/l - micrograms per liter
NA - Not Analyzed
Bold indicates a detection

Table 7D-7(a)
Groundwater Constituents Average Concentrations for VOCs
in Sub-area 6D: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)						
	1,1,1-TRICHLOROETHANE	1,1-DICHLOROETHANE	1,1-DICHLOROETHENE	CIS-1,2-DICHLOROETHENE	TETRACHLOROETHENE	TOLUENE	TRICHLOROETHENE
B27E12W	2.5	2.5	2.5	2.5	24.5	2.5	2.5
B27E16W	0.5	0.5	0.5	0.5	1.25	1.167	3.1
MW6W	0.72	0.72	0.67	0.80	9.17	2.27	3.04
Average Concentration - Only Samples With VOC Detections	**1.24**	**1.24**	**1.22**	**1.27**	**11.64**	**1.98**	**2.88**

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed

Table 7D-7(b)
Groundwater Constituents Average Concentrations for Metals in Sub-area 6D:
GKN Facility
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/l)					
	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	MERCURY
MW6W	**12.86**	**625.8**	**2.76**	**77.64**	**21.74**	**0.106**
SEWERW	5	**886**	2500	5	**10.8**	0.1
Average Concentration - Only Samples With Metals Detections	**8.93**	**755.90**	**1251**	**41.32**	**16.27**	**0.10**

Notes:
ug/l - micrograms per liter
NA - Not Analyzed
Bold indicates a detection

Table 7A-8(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Sub-area 6A: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
None	5	0	N/A	ND	N/A	NA	N/A
Pesticides							
None	2	0	N/A	ND	N/A	N/A	N/A

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 7A-8(b)
Soil Constituents of Concern Summary for Construction Worker for Sub-area 6A: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Acetone	5	3	1.34	41	30.50	NA	N/A
Methyl ethyl ketone (MEK)	5	2	1.37	24	17.50	NA	N/A
Polynuclear Aromatic Hydrocabons (PAHs)							
Chrysene	4	1	1.00	1,500	1,500	N/A	N/A
Polychlorinated Biphenyls (PCBs)							
None	3	0	N/A	ND	N/A	N/A	N/A
Pesticides							
None	2	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	4	0	N/A	ND	N/A	NA	N/A
TPH GRO	4	0	N/A	ND	N/A	NA	N/A
Total Metals							
Arsenic	3	3	1.42	9,500	6,700	9,200	Y
Barium	3	3	1.78	213,000	119,567	725,000	N
Chromium	3	3	1.37	20,300	14,867	58,000	N
Lead	3	3	1.28	11,200	8,767	21,800	N
Mercury	3	3	1.42	26	18	39	N
Selenium	3	1	1.19	420	353	260	Y

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 7B-8(a)
Soil Constituents of Concern Summary for Non-residential Worker for Sub-area 6B: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Acetone	16	6	2.55	200	78.50	NA	N/A
cis-1,2-Dichloroethene	16	4	3.20	240	74.89	NA	N/A
Ethylbenzene	15	1	2.24	11	4.91	NA	N/A
Methylene chloride	15	2	2.47	31	12.54	NA	N/A
Tetrachloroethene	16	5	3.69	43	11.66	NA	N/A
Toluene	15	2	3.80	51	13.41	NA	N/A
trans-1,2-Dichlorobenzene	10	1	1.00	36	36.00	NA	N/A
Trichloroethene	15	4	4.44	120	27.04	NA	N/A
Vinyl chloride	15	1	2.56	18	7.03	NA	N/A
Xylenes, Total	16	1	4.65	64	13.76	NA	N/A
Polynuclear Aromatic Hydrocabons (PAHs)							
Acenaphthene	15	1	1.99	6,800	3,411	NA	N/A
Acenaphthylene	15	1	1.54	74	48	NA	N/A
Benzo(a)anthracene	15	1	1.58	42	26.63	NA	N/A
Benzo(b)fluoranthene	15	1	1.58	42	26.63	NA	N/A
Chrysene	15	3	1.56	300	192.50	NA	N/A
Fluoranthene	15	2	2.39	520	217.33	NA	N/A
Fluorene	15	1	1.48	62	42.00	NA	N/A
Pyrene	15	1	2.78	500	180.00	NA	N/A
Polychlorinated Biphenyls (PCBs)							
None	4	0	N/A	ND	N/A	N/A	N/A
Pesticides							
None	1	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	2	0	N/A	ND	17,500	NA	N/A
TPH GRO	2	2	1.73	1,400	810	NA	N/A
tal Metals							
luminum	10	10	1.37	12,700,000	9,280,000	41,000,000	N
Antimony	10	10	1.39	5,510	3,964	520	Y
Arsenic	16	16	4.68	130,000	27,807	9,200	Y
Barium	16	16	2.23	306,000	137,333	725,000	N
Beryllium	10	10	1.43	1,340	937	800	Y
Cadmium	16	4	4.33	2,520	582.6	<1,000	Y
Calcium	10	10	3.19	90,100,000	28,271,000	3,300,000	Y
Chromium	16	16	1.39	22,700	16,283	58,000	N
Cobalt	10	10	1.80	15,100	8,404	10,000	Y
Copper	10	10	1.45	28,100	19,350	13,000	Y
Iron	10	10	2.28	42,400,000	18,575,000	21,000,000	Y
Lead	16	16	1.78	32,700	18,333	21,800	Y
Magnesium	10	10	1.97	22,000,000	11,190,000	2,600,000	Y
Manganese	10	10	3.98	4,310,000	1,084,100	740,000	Y
Mercury	16	12	1.75	60	34	39	Y
Nickel	10	10	2.21	62,300	28,150	14,000	Y
Potassium	10	10	1.33	1,080,000	813,400	14,000,000	N
Selenium	16	3	3.35	5,650	1,687	260	Y
Sodium	10	10	2.48	1,510,000	608,000	5,300,000	N
Vanadium	10	10	1.31	47,700	36,300	69,000	N
Zinc	10	10	1.29	67,500	52,140	49,000	Y

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Tat[illegible]b)
Soil Constituents of Concern Summary for Construction Worker for Sub-area 6B: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			Max Detected Exceeds Background
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	
Volatile Organic Compounds (VOCs)							
1,1-Dichloroethane	46	1	0.52	1.6	3.10	NA	N/A
1,1-Dichloroethene	32	1	2.13	7.5	3.53	NA	N/A
Acetone	36	17	6.48	200	30.85	NA	N/A
cis-1,2-Dichloroethene	53	8	12.32	1,800	146.16	NA	N/A
Ethylbenzene	44	3	16.28	2,000	122.83	NA	N/A
Methyl ethyl ketone (MEK)	26	2	1.79	25	13.93	NA	N/A
Methylene chloride	46	10	4.19	31	7.40	NA	N/A
Tetrachloroethene	50	9	5.22	43	8.24	NA	N/A
Toluene	44	4	16.96	83,000	4,892.95	NA	N/A
trans-1,2-Dichloroethene	24	1	7.27	160	22.02	NA	N/A
trans-1,2-Dichlorobenzene	14	1	1.00	36	36.00	NA	N/A
Trichloroethene	45	9	9.30	390	41.93	NA	N/A
Vinyl chloride	46	5	11.49	600	52.20	NA	N/A
Xylenes, Total	50	2	0.17	64	381.8	NA	N/A
Polynuclear Aromatic Hydrocabons (PAHs)							
Acenaphthene	30	1	5.91	6,800	1,150.13	NA	N/A
Acenaphthylene	30	1	2.54	74	29.13	NA	N/A
Benzo(a)anthracene	30	2	2.44	42	17.23	NA	N/A
Benzo(b)fluoranthene	30	1	3.00	42	13.98	NA	N/A
Chrysene	30	5	2.51	300	119.44	NA	N/A
Fluoranthene	30	2	5.12	520	101.66	NA	N/A
Fluorene	30	1	2.29	62	27.13	NA	N/A
Phenanthrene	30	1	0.30	5.07	17.10	NA	N/A
Pyrene	30	1	5.84	500	85.66	NA	N/A
Polychlorinated Biphenyls (PCBs)							
Aroclor 1254	12	1	1.00	100	100.00	NA	N/A
Pesticides							
None	1	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	14	1	5.53	980,000	177,083	NA	N/A
TPH GRO	14	5	5.16	16,000	3,103	NA	N/A
Total Metals							
Aluminum	14	10	1.37	12,700,000	9,280,000	41,000,000	N
Antimony	14	10	1.39	5,510	3,964	520	Y
Arsenic	43	35	9.11	130,000	14,266	9,200	Y
Barium	43	39	2.43	306,000	125,724	725,000	N
Beryllium	14	10	1.43	1,340	937	800	Y
Cadmium	43	9	5.24	2,520	481.3	<1,000	Y
Calcium	14	10	3.19	90,100,000	28,271,000	3,300,000	Y
Chromium	43	39	1.99	31,000	15,617	58,000	N
Cobalt	14	10	1.80	15,100	8,404	10,000	Y
Copper	14	10	1.45	28,100	19,350	13,000	Y
Iron	14	10	2.28	42,400,000	18,575,000	21,000,000	Y
Lead	43	39	2.65	32,700	12,347	21,800	Y
Magnesium	14	10	1.97	22,000,000	11,190,000	2,600,000	Y
Manganese	14	10	3.98	4,310,000	1,084,100	740,000	Y
Mercury	43	22	1.41	60	42	39	Y
Nickel	14	10	2.21	62,300	28,150	14,000	Y
Potassium	14	10	1.33	1,080,000	813,400	14,000,000	N
Selenium	43	5	6.14	5,650	920	260	Y
Sodium	14	10	2.48	1,510,000	608,000	5,300,000	N
Vanadium	14	10	1.31	47,700	36,300	69,000	N
Zinc	14	10	1.29	67,500	52,140	49,000	Y

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 7C-8(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Sub-area 6C: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Acetone	11	4	2.02	110	54.50	NA	N/A
cis-1,2-Dichloroethene	13	1	0.96	2.4	2.50	NA	N/A
Dichlorodifluoromethane	4	2	1.00	3.6	3.60	NA	N/A
Ethylbenzene	18	1	5.93	3,200	539.63	NA	N/A
Methyl ethyl ketone (MEK)	11	2	1.37	18	13.10	NA	N/A
Methyl isobutyl ketone	11	1	0.59	6.7	11.30	NA	N/A
o-Xylene	5	1	2.00	1,200	600.25	NA	N/A
Trichloroethene	14	1	2.61	11	4.22	NA	N/A
Xylenes, Total	17	1	5.82	1,200	206	NA	N/A
Polynuclear Aromatic Hydrocabons (PAHs)							
Chrysene	8	2	1.82	740	406.00	NA	N/A
Polychlorinated Biphenyls (PCBs)							
None	7	0	N/A	ND	N/A	N/A	N/A
Pesticides							
None	2	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	14	5	2.47	1,400,000	566,000	NA	N/A
TPH GRO	15	1	5.00	320,000	64,052	NA	N/A
Total Metals							
Arsenic	10	10	2.28	13,800	6,061	9,200	Y
Barium	10	10	1.80	293,000	163,011	725,000	N
Cadmium	10	2	2.04	740	363.3	<1,000	N
Chromium	11	11	4.20	114,000	27,165	58,000	Y
Lead	10	10	1.47	16,200	11,022	21,800	N
Mercury	10	8	1.43	47	33	39	Y
Selenium	10	1	1.55	530	342	260	Y

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 7C-8(b)
Soil Constituents of Concern Summary for Construction Worker for Sub-area 6C: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			Max Detected Exceeds Background
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	
Volatile Organic Compounds (VOCs)							
Acetone	27	5	4.10	110	26.83	NA	N/A
Chloroform	39	1	0.72	2.1	2.92	NA	N/A
cis-1,2-Dichloroethene	39	3	2.02	7	3.47	NA	N/A
Dichlorodifluoromethane	4	2	1.00	3.6	3.60	NA	N/A
Ethylbenzene	41	1	13.73	3,200	233.11	NA	N/A
Methyl ethyl ketone (MEK)	27	8	1.45	18	12.38	NA	N/A
Methyl isobutyl ketone	27	1	0.54	6.7	12.43	NA	N/A
o-Xylene	5	1	2.00	1,200	600.25	NA	N/A
Trichloroethene	39	6	9.85	290	29.44	NA	N/A
Xylenes, Total	40	1	13.30	1,200	90.25	NA	N/A
Polynuclear Aromatic Hydrocabons (PAHs)							
Benzo(a)anthracene	17	1	1.42	94	66.17	NA	N/A
Benzo(b)fluoranthene	17	1	0.82	39	47.83	NA	N/A
Chrysene	17	3	2.70	740	273.83	NA	N/A
Fluoranthene	17	1	0.52	44	84.17	NA	N/A
Polychlorinated Biphenyls (PCBs)							
None	15	0	N/A	ND	N/A	N/A	N/A
Pesticides							
None	2	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	23	6	4.29	4,500,000	1,049,429	NA	N/A
TPH GRO	23	3	6.99	320,000	45,807	NA	N/A
Total Metals							
Arsenic	27	27	2.37	13,800	5,817	9,200	Y
Barium	27	27	2.86	418,000	146,346	725,000	N
Cadmium	27	11	4.48	1,900	424.5	<1,000	Y
Chromium	28	28	5.76	114,000	19,798	58,000	Y
Lead	27	27	1.62	16,200	10,000	21,800	N
Mercury	27	17	1.23	47	38	39	Y
Selenium	27	1	1.61	530	329	260	Y

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 7D-8(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Sub-area 6D: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Dichlorodifluoromethane	5	1	1.54	8.4	5.45	NA	N/A
Toluene	5	1	1.35	52	38.50	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	4	0	N/A	ND	2,500	NA	N/A
TPH GRO	4	1	1.00	12,000	12,000	NA	N/A
TPH ORO	4	0	N/A	ND	2,500	NA	N/A
Total Metals							
Arsenic	2	2	1.13	5,800	5,150	9,200	N
Barium	2	2	1.17	174,000	148,500	725,000	N
Cadmium	2	1	1.42	740	522.5	<1,000	N
Chromium	2	2	1.31	21,000	16,000	58,000	N
Lead	2	2	1.17	14,400	12,300	21,800	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 7D-8(b)
Soil Constituents of Concern Summary for Construction Worker for Sub-area 6D: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Dichlorodifluoromethane	5	1	1.54	8.4	5.45	NA	N/A
Methyl ethyl ketone (MEK)	4	1	0.18	12	68.50	NA	N/A
Toluene	7	1	1.95	52	26.73	NA	N/A
Polynuclear Aromatic Hydrocabons (PAHs)							
None	1	0	N/A	ND	N/A	N/A	N/A
Polychlorinated Biphenyls (PCBs)							
None	1	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	5	0	N/A	ND	2,500	NA	N/A
TPH GRO	5	1	1.00	12,000	12,000	NA	N/A
TPH ORO	4	0	N/A	ND	2,500	NA	N/A
Total Metals							
Arsenic	4	4	1.91	17,700	9,250	9,200	Y
Barium	4	4	1.23	195,000	158,750	725,000	N
Cadmium	4	3	1.58	760	481.3	<1,000	N
Chromium	4	4	1.37	21,000	15,325	58,000	N
Lead	4	4	1.83	27,700	15,175	21,800	N
Mercury	4	1	0.40	21	53	39	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 7A-9
Groundwater Constituents of Concern Summary for Sub-area 6A: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
Acetone	12	1	0.44	4.6	10.45	121	N
Benzene	12	1	9.43	7.2	0.76	5	Y
Bromodichloromethane	12	1	1.01	0.6	0.59	60	N
Carbon Disulfide	6	1	0.62	0.52	0.84	201	N
Chloroform	12	1	1.13	1.7	1.51	400	N
cis-1,2-Dichloroethene	8	1	1.45	1.1	0.76	70	N
Dibromochloromethane	6	1	0.47	0.37	0.79	40	N
Methylene chloride	12	2	0.64	0.77	1.20	49.1	N
Trichloroethene	12	1	1.92	2.1	1.09	5	N
Polynuclear Aromatic Hydrocabons (PAHs)							
None	2	0	N/A	ND	N/A	N/A	N/A
Polychlorinated Biphenyls (PCBs)							
None	1	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	4	0	N/A	ND	250	NA	N/A
TPH GRO	3	1	1.00	730	730	NA	N/A
Total Metals							
Arsenic	8	4	1.93	196	102	10	Y
Barium	8	8	1.98	22,900	11,567	2,000	Y
Cadmium	6	1	1.78	13.4	7.54	5	Y
Chromium	7	5	1.97	1,060	539	100	Y
Lead	7	4	1.96	388	198	15	Y
Mercury	7	3	1.91	1.5	0.79	2	N
Selenium	3	1	0.42	7	16.63	50	N

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 7B-9
Groundwater Constituents of Concern Summary for Sub-area 6B: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
1,1,2-Trichloro-1,2,2-Trifluoroethane	13	3	10.93	7,000	640.31	12.3	Y
1,1-Dichloroethane	136	24	1.99	17	8.55	157	N
1,1-Dichloroethene	139	20	3.26	26	7.97	7.0	Y
1,2,3-Trimethylbenzene	13	1	4.21	3.1	0.74	2.6	Y
1,2,4-Trimethylbenzene	105	3	0.80	2.7	3.36	2.6	Y
1,2-Dichlorobenzene	107	12	14.86	200	13.46	600	N
1,2-Dichloropropane	135	1	0.25	1.9	7.58	5	N
1,3-Dichlorobenzene	105	3	0.99	3.2	3.22	600	N
1,4-Dichlorobenzene	107	11	5.42	23.0	4.24	75	N
Acetone	135	11	0.83	74.0	88.71	121	N
Benzene	136	7	11.27	150	13.31	5	Y
Bromodichloromethane	136	1	0.24	1.8	7.58	60	N
Bromomethane	135	1	1.62	23	14.22	10	Y
Carbon Disulfide	38	3	0.06	0.51	7.88	201	N
Chloroethane	135	1	0.08	1.2	14.13	48.8	N
Chloroform	135	6	0.93	11	11.85	400	N
cis-1,2-Dichloroethene	144	92	13.06	7,600	582.14	70	Y
Dichlorodifluoromethane	105	2	19.95	700	35.09	1,000	N
Ethylbenzene	136	4	0.55	4.2	7.71	700	N
Isopropylbenzene	105	2	1.29	4.5	3.50	4,000	N
Methyl ethyl ketone (MEK)	135	1	1.09	87	79.96	4,000	N
Methyl ter-butyl ether	106	7	29.47	930	31.55	146	Y
Methylene chloride	138	11	40.51	520	12.84	49.1	Y
n-Propylbenzene	105	2	0.72	2.4	3.33	5.3	N
sec-Butylbenzene	105	2	0.44	1.4	3.20	48.6	N
tert-Butylbenzene	105	1	0.47	1.5	3.19	48.6	N
Tetrachloroethene	137	17	13.29	260.0	19.56	5	Y
Toluene	138	13	3.15	41.0	13.02	1,000	N
trans-1,2-Dichloroethene	127	69	7.02	410	58.37	100	Y
Trichloroethene	144	70	71.52	8,000	111.85	5	Y
Trichlorofluoromethane	106	7	2.84	10	3.52	2,000	N
Vinyl chloride	141	74	18.15	2,700	148.77	2	Y
Xylenes, Total	136	4	1.19	12	10.06	10,000	N
Polynuclear Aromatic Hydrocabons (PAHs)							
Acenaphthene	11	1	1.26	43	34	2,000	N
Benzo(a)anthracene	11	1	1.98	250	126	0.921	Y
Chrysene	11	1	1.55	86	56	92.1	N
Polychlorinated Biphenyls (PCBs)							
Aroclor 1254	17	2	1.96	580	296	0.5	Y
Pesticides							
None	1	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	20	7	10.16	340,000	33,451	NA	N/A
TPH GRO	16	10	3.61	3,600	996	NA	N/A
TPH ORO	3	0	N/A	ND	150	NA	N/A
Total Metals							
Arsenic	65	43	5.35	577	108	10	Y
Barium	67	67	10.48	57,000	5,440	2,000	Y
Cadmium	62	15	0.04	42	1,176.5	5	Y
Chromium	67	50	6.22	2,560	412	100	Y
Lead	65	51	6.24	1,180	189	15	Y
Manganese	1	1	1.00	6,400	6,400	50	Y
Mercury	64	28	110.97	130	1.17	2	Y
Selenium	34	4	3.79	36.4	10	50	N
Silver	34	1	0.22	1.2	5	100	N

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 7C-9
Groundwater Constituents of Concern Summary for Sub-area 6C: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
1,1,2-Trichloroethane	106	1	1.95	1.3	0.67	5	N
1,1-Dichloroethene	110	3	2.27	2.0	0.88	7.0	N
2-Hexanone (MBK)	34	1	3.75	16	4.26	1.74	Y
Acetone	104	6	3.13	36	11.49	121	N
Benzene	115	3	2.48	1.9	0.77	5	N
Bromodichloromethane	106	1	1.15	0.73	0.63	60	N
Carbon Disulfide	35	3	2.17	2.3	1.06	201	N
Carbon Tetrachloride	110	1	0.45	0.32	0.72	5	N
Chloroform	110	2	1.64	2.0	1.22	400	N
cis-1,2-Dichloroethene	112	36	2.05	196.3	95.65	70	Y
Dichlorodifluoromethane	81	2	1.45	2.2	1.52	1,000	N
Methyl ethyl ketone (MEK)	104	2	1.91	16	8.39	4,000	N
Methyl isobutyl ketone	104	1	0.36	2.7	7.60	32.7	N
Methylene chloride	110	4	0.54	0.6	1.12	49.1	N
Tetrachloroethene	110	2	3.82	3.5	0.92	5	N
Toluene	115	5	1.47	1.6	1.08	1,000	N
trans-1,2-Dichloroethene	96	8	3.31	4.9	1.48	100	N
Trichloroethene	112	25	11.26	2,700	239.76	5	Y
Vinyl chloride	110	15	5.98	31	5.19	2	Y
Polynuclear Aromatic Hydrocabons (PAHs)							
None	14	0	N/A	ND	N/A	N/A	N/A
Polychlorinated Biphenyls (PCBs)							
None	11	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	56	21	9.54	120,000	12,575	NA	N/A
TPH GRO	30	6	3.49	710	203	NA	N/A
TPH ORO	12	2	3.36	3,430	1,022	NA	N/A
Total Metals							
Arsenic	89	40	8.30	674	81	10	Y
Barium	90	90	12.94	33,300	2,574	2,000	Y
Cadmium	89	11	0.03	19	668.6	5	Y
Chromium	90	67	20.58	49,000	2,381.48	100	Y
Chromium, Hexavalent	13	5	1.21	20	16	NA	N/A
Iron	6	5	1.29	2170.25	1,685.46	300	Y
Lead	89	49	10.07	1,170	116	15	Y
Mercury	89	25	15.96	12.2	0.76	2	Y
Selenium	44	2	0.39	5.4	13.82	50	N

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 7D-9
Groundwater Constituents of Concern Summary for Sub-area 6D: GKN Facility
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
1,1,1-Trichloroethane	28	1	0.78	0.97	1.24	200	N
1,1-Dichloroethane	28	1	0.77	0.96	1.24	157	N
1,1-Dichloroethene	28	1	0.29	0.35	1.22	7.0	N
cis-1,2-Dichloroethene	27	1	1.18	1.5	1.27	70	N
Tetrachloroethene	28	13	2.10	24.5	11.64	5	Y
Toluene	33	2	1.01	2.0	1.98	1,000	N
Trichloroethene	28	12	1.42	4.1	2.88	5	N
Polynuclear Aromatic Hydrocabons (PAHs)							
None	1	0	N/A	ND	N/A	N/A	N/A
Polychlorinated Biphenyls (PCBs)							
None	1	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	5	0	N/A	ND	N/A	NA	N/A
TPH GRO	5	0	N/A	ND	N/A	NA	N/A
TPH ORO	5	0	N/A	ND	N/A	NA	N/A
Total Metals							
Arsenic	12	2	1.94	17.3	8.93	10	Y
Barium	12	5	1.23	929	755.9	2,000	N
Cadmium	11	1	0.00	4.3	1,251.4	5	N
Chromium	12	5	4.11	170	41.32	100	Y
Lead	12	3	2.41	39.2	16.27	15	Y
Mercury	11	1	1.26	0.13	0.10	2	N

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 7A-10(a)

Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker

Sub-area 6A: GKN Facility, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc. (ug/kg)	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
		IELCR	HQ		IELCR	HQ		
Benzene	---	---	---	0.76	1.12E-10	6.37E-06	1.12E-10	6.37E-06
Organics Total Risk		**NA**	**NA**		**1.12E-10**	**6.37E-06**	**1.12E-10**	**6.37E-06**
TPH-GRO	---	---	---	730	NA	4.46E-03	NA	4.46E-03
TPH-DRO	---	---	---	250	NA	4.95E-02	NA	4.95E-02
TPH Total Risk		**NA**	**NA**		**NA**	**5.40E-02**	**NA**	**5.40E-02**
Arsenic	---	---	---	102	NA	NA	NA	NA
Barium	---	---	---	11,567	NA	NA	NA	NA
Cadmium	---	---	---	7.5	NA	NA	NA	NA
Chromium	---	---	---	539	NA	NA	NA	NA
Metals Total Risk		**NA**	**NA**		**NA**	**NA**	**NA**	**NA**
CUMULATIVE RISK		**NA**	**NA**		**1.12E-10**	**5.40E-02**	**1.12E-10**	**5.40E-02**

Notes:

NA: Not available

---: Risk evaluation was not performed.

HI: Hazard index

TPH: Total petroleum hydrocarbon

GRO: Gasoline range organic

ug/L: Micrograms per liter

ug/kg: Micrograms per kilogram

Table 7A-10(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 6A: GKN Facility, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
Acetone	30.5	NA	1.06E-07	NA	1.12E-07	NA	2.64E-07	---	---	---	---	---	NA	4.83E-07
Benzene	---	---	---	---	---	---	---	0.76	1.46E-10	1.18E-04	5.94E-14	8.43E-08	1.46E-10	1.18E-04
Chrysene	1,500	2.36E-11	NA	6.06E-11	NA	3.49E-13	NA	---	---	---	---	---	8.46E-11	NA
Methyl ethyl ketone (MEK)	17.5	NA	1.02E-08	NA	1.13E-08	NA	3.94E-08	---	---	---	---	---	NA	6.09E-08
Organics Total Risk		**2.36E-11**	**1.17E-07**	**6.06E-11**	**1.24E-07**	**3.49E-13**	**3.04E-07**		**1.46E-10**	**1.18E-04**	**5.94E-14**	**8.43E-08**	**2.31E-10**	**1.18E-04**
TPH-GRO	---	---	---	---	---	---	---	730	NA	NA	NA	3.98E-05	NA	3.98E-05
TPH-DRO	---	---	---	---	---	---	---	250	NA	NA	NA	4.39E-04	NA	4.39E-04
TPH Total Risk		**NA**	**NA**	**NA**	**NA**	**NA**	**NA**		**NA**	**NA**	**NA**	**4.79E-04**	**NA**	**4.79E-04**
Arsenic	6,700	1.67E-10	2.60E-05	5.28E-08	8.22E-03	8.79E-11	1.37E-06	102	NA	NA	NA	NA	5.31E-08	8.25E-03
Barium	---	---	---	---	---	---	---	11,567	NA	NA	NA	NA	NA	NA
Cadmium	---	---	---	---	---	---	---	7.5	NA	NA	NA	NA	NA	NA
Chromium	---	---	---	---	---	---	---	539	NA	NA	NA	NA	NA	NA
Selenium	353	NA	8.21E-06	NA	2.74E-05	NA	3.80E-07	---	---	---	---	---	NA	3.60E-05
Metals Total Risk		**1.67E-10**	**3.42E-05**	**5.28E-08**	**8.25E-03**	**8.79E-11**	**1.75E-06**		**NA**	**NA**	**NA**	**NA**	**5.31E-08**	**8.28E-03**
CUMULATIVE RISK		**1.91E-10**	**3.43E-05**	**5.29E-08**	**8.25E-03**	**8.83E-11**	**2.05E-06**		**1.46E-10**	**1.18E-04**	**5.94E-14**	**4.79E-04**	**5.33E-08**	**8.88E-03**

Notes:
NA: Not available
---: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
GRO: Gasoline range organic
ug/L: Micrograms per liter
ug/kg: Micrograms per kilogram

Table 7B-10(a)

Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker

Sub-area 6B: GKN Facility, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ		IELCR	HQ		
1,1-Dichloroethene	—	—	—	8.0	3.64E-08	1.02E-05	3.64E-08	1.02E-05
1,1,2-Trichloro-1,2,2-trifluoroethane	—	—	—	640	NA	3.34E-05	NA	3.34E-05
1,2,3-Trimethylbenzene	—	—	—	0.7	NA	3.16E-06	NA	3.16E-06
1,2,4-Trimethylbenzene	—	—	—	3.4	NA	2.91E-05	NA	2.91E-05
Acetone	78.5	NA	8.88E-07	—	—	—	NA	8.88E-07
Benzene	—	—	—	13	2.18E-09	1.24E-04	2.18E-09	1.24E-04
Bromomethane	—	—	—	14	NA	1.54E-04	NA	1.54E-04
cis-1,2-Dichloroethene	75	NA	4.36.E-05	582	NA	5.97E-04	NA	6.41E-04
Dichlorodifluoromethane	—	—	—	35	NA	1.47E-04	NA	1.47E-04
Ethylbenzene	4.9	NA	2.09E-08	—	—	—	NA	2.09E-08
Methylene chloride	—	—	—	13	5.73E-11	1.13E-07	5.73E-11	1.13E-07
Methyl tert-butyl ether (MTBE)	—	—	—	32	6.91E-12	6.43E-08	6.91E-12	6.43E-08
Tetrachloroethene	12	5.34E-11	6.44E-07	20	5.75E-10	6.95E-06	6.29E-10	7.59E-06
Toluene	13	NA	2.79E-07	—	—	—	NA	2.79E-07
trans-1,2-Dichlorobenzene	36	NA	1.04E-07	—	—	—	NA	1.04E-07
trans-1,2-Dichloroethene	—	—	—	58	NA	6.17E-05	NA	6.17E-05
Trichloroethene	27	2.10E-10	9.87E-06	112	6.07E-09	2.85E-04	6.28E-09	2.95E-04
Vinyl chloride	7.0	6.39E-08	2.09E-05	149	1.33E-06	4.34E-04	1.39E-06	4.55E-04
Xylenes, total	14	NA	6.58E-08	—	—	—	NA	6.58E-08
Aroclor 1254	—	—	—	296	NA	NA	NA	NA
Acenaphthene	3,411	NA	5.04E-08	—	—	—	NA	5.04E-08
Acenaphthylene	48	NA	5.86E-10	—	—	—	NA	5.86E-10
Benzo(a)anthracene	27	2.84E-14	NA	126	2.56E-09	NA	2.56E-09	NA
Benzo(b)fluoranthene	27	1.61E-14	NA	—	—	—	1.61E-14	NA
Chrysene	193	3.57E-15	NA	—	—	—	3.57E-15	NA
Fluoranthene	217	NA	7.25E-11	—	—	—	NA	7.25E-11
Fluorene	42	NA	2.34E-10	—	—	—	NA	2.34E-10
Pyrene	180	NA	8.19E-11	—	—	—	NA	8.19E-11
Organics Total Risk		**6.41E-08**	**7.64E-05**		**1.37E-06**	**1.89E-03**	**1.44E-06**	**1.96E-03**
Aliphatics > nC6 to nC8 (TX1006)	—	—	—	885	NA	6.06E-04	NA	6.06E-04
Aliphatics > nC8 to nC10 (TX1006)	—	—	—	55	NA	1.11E-03	NA	1.11E-03
Aromatics > nC8 to nC10 (TX1006)	—	—	—	55	NA	3.52E-05	NA	3.52E-05
TPH-GRO	810	NA	8.30E-06	996	NA	1.75E-03	NA	1.76E-03

Table 7B-10(a)

Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker

Sub-area 6B: GKN Facility, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ		IELCR	HQ		
Aliphatics > nC10 to nC12 (TX1006)	—	—	—	5,575	NA	1.68E-01	NA	1.68E-01
Aliphatics > nC12 to nC16 (TX1006)	—	—	—	5,575	NA	7.29E-01	NA	7.29E-01
Aliphatics > nC16 to nC21 (TX1006)	—	—	—	5,575	NA	6.87E+00	NA	6.87E+00
Aromatics > nC10 to nC12 (TX1006)	—	—	—	5,575	NA	1.10E-03	NA	1.10E-03
Aromatics > nC12 to nC16 (TX1006)	—	—	—	5,575	NA	4.43E-04	NA	4.43E-04
Aromatics > nC16 to nC21 (TX1006)	—	—	—	5,575	NA	1.19E-04	NA	1.19E-04
TPH-DRO	17,500	NA	1.77E-05	33,451	NA	7.77E+00	NA	7.77E+00
Aliphatics > nC21 to nC35 (TX1006)	—	—	—	75	NA	9.24E-02	NA	9.24E-02
Aromatics > nC21 to nC35 (TX1006)	—	—	—	75	NA	1.83E-07	NA	1.83E-07
TPH-ORO	—	—	—	150	NA	9.24E-02	NA	9.24E-02
TPH Total Risk		NA	2.60E-05		NA	7.86E+00	NA	7.86E+00
Arsenic	27,807	NA	NA	108	NA	NA	NA	NA
Barium	—	—	—	5,440	NA	NA	NA	NA
Cadmium	583	NA	NA	1,177	NA	NA	NA	NA
Chromium	—	—	—	412	NA	NA	NA	NA
Mercury	34	NA	9.69E-05	1.2	NA	1.53E-04	NA	2.50E-04
Selenium	1,687	NA	NA	—	—	—	NA	NA
Antimony	3,964	NA	NA	—	—	—	NA	NA
Beryllium	937	NA	NA	—	—	—	NA	NA
Cobalt	8,404	NA	NA	—	—	—	NA	NA
Copper	19,350	NA	NA	—	—	—	NA	NA
Manganese	1,084,100	NA	NA	6,400	NA	NA	NA	NA
Nickel	28,150	NA	NA	—	—	—	NA	NA
Zinc	52,140	NA	NA	—	—	—	NA	NA
Metals Total Risk		NA	9.69E-05		NA	1.53E-04	NA	2.50E-04
CUMULATIVE RISK		6.41E-08	1.99E-04		1.37E-06	7.86E+00	1.44E-06	7.86E+00

Notes:
NA: Not available
—: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
GRO: Gasoline range organic
DRO: Diesel range organic
ORO: Oil range organic
ug/L: Micrograms per liter
ug/kg: Micrograms per kilogram

Table 7B-10(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 6B: GKN Facility, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
1,1-Dichloroethane	3.1	NA	3.60E-08	NA	1.20E-08	NA	5.31E-08	—	—	—	—	—	NA	1.01E-07
1,1-Dichloroethene	3.5	1.06E-11	1.37E-07	1.17E-11	1.52E-07	3.81E-11	2.68E-07	8.0	2.42E-08	3.14E-04	2.31E-11	1.62E-07	2.43E-08	3.14E-04
1,1,2-Trichloro-1,2,2-trifluoroethane	—	—	—	—	—	—	—	640	NA	NA	NA	4.81E-07	NA	4.81E-07
1,2,3-Trimethylbenzene	—	—	—	—	—	—	—	0.7	NA	NA	NA	8.80E-08	NA	8.80E-08
1,2,4-Trimethylbenzene	—	—	—	—	—	—	—	3.4	NA	NA	NA	5.94E-07	NA	5.94E-07
Acetone	31	NA	1.08E-07	NA	1.14E-07	NA	2.67E-07	—	—	—	—	—	NA	4.88E-07
Benzene	—	—	—	—	—	—	—	13	2.56E-09	2.06E-03	1.94E-12	2.76E-06	2.57E-09	2.07E-03
Bromomethane	—	—	—	—	—	—	—	14	NA	7.87E-04	NA	3.80E-06	NA	7.91E-04
cis-1,2-Dichloroethene	146	NA	5.10E-07	NA	5.66E-06	NA	2.87E-05	582	NA	NA	NA	1.71E-05	NA	5.20E-05
Dichlorodifluoromethane	—	—	—	—	—	—	—	35	NA	4.66E-05	NA	2.16E-06	NA	4.88E-05
Ethylbenzene	123	NA	4.28E-07	NA	4.38E-07	NA	3.83E-07	—	—	—	—	—	NA	1.25E-06
Methyl ethyl ketone (MEK)	13.9	NA	8.10E-09	NA	9.00E-09	NA	3.14E-08	—	—	—	—	—	NA	4.85E-08
Methyl tert-butyl ether (MTBE)	—	—	—	—	—	—	—	32	1.48E-10	3.66E-06	2.59E-14	6.02E-09	1.48E-10	3.66E-06
Methylene chloride	7.4	2.76E-13	4.30E-08	3.07E-13	4.78E-08	4.61E-13	2.28E-08	13	2.10E-09	3.27E-04	8.11E-14	4.01E-09	2.10E-09	3.27E-04
Tetrachloroethene	8.24	2.13E-13	2.87E-08	2.37E-12	3.19E-07	4.89E-13	1.47E-07	20	1.54E-08	2.08E-03	3.84E-13	1.16E-07	1.54E-08	2.08E-03
Toluene	4,893	NA	8.53E-07	NA	9.48E-06	NA	5.37E-05	—	—	—	—	—	NA	6.41E-05
trans-1,2-Dichlorobenzene	36	NA	1.39E-07	NA	7.75E-08	NA	2.08E-07	—	—	—	—	—	NA	4.25E-07
trans-1,2-Dichloroethene	22	NA	3.84E-08	NA	4.27E-07	NA	2.66E-06	58	NA	NA	NA	1.33E-06	NA	4.45E-06
Trichloroethene	42	3.83E-15	4.06E-09	2.55E-12	2.71E-06	5.55E-12	6.52E-06	112	6.23E-09	6.60E-03	4.55E-12	5.34E-06	6.24E-09	6.62E-03
Vinyl chloride	52	4.94E-13	6.07E-09	5.49E-10	6.74E-06	1.66E-09	1.36E-05	149	6.53E-07	8.01E-03	7.61E-10	6.22E-06	6.56E-07	8.04E-03
Xylenes, Total	382	NA	6.66E-08	NA	6.81E-08	NA	1.52E-06	—	—	—	—	—	NA	1.65E-06
Aroclor 1254	100	4.65E-10	8.14E-04	1.11E-09	1.94E-03	1.75E-13	3.06E-07	296	NA	NA	NA	NA	1.57E-09	2.75E-03
Acenaphthene	1,150	NA	6.68E-06	NA	7.43E-06	NA	4.66E-07	—	—	—	—	—	NA	1.46E-05
Acenaphthylene	29	NA	5.64E-07	NA	1.88E-07	NA	1.07E-08	—	—	—	—	—	NA	7.63E-07
Benzo(a)anthracene	17	2.72E-11	NA	6.96E-11	NA	3.07E-13	NA	126	2.36E-05	NA	8.64E-11	NA	2.36E-05	NA
Benzo(b)fluoranthene	14	2.20E-11	NA	5.65E-11	NA	1.90E-13	NA	—	—	—	—	—	7.87E-11	NA
Chrysene	119	1.88E-12	NA	4.83E-12	NA	2.78E-14	NA	—	—	—	—	—	6.74E-12	NA
Fluoranthene	102	NA	2.95E-07	NA	4.92E-07	NA	7.72E-09	—	—	—	—	—	NA	7.96E-07
Fluorene	27	NA	2.36E-07	NA	2.63E-07	NA	8.29E-09	—	—	—	—	—	NA	5.08E-07
Phenanthrene	17	NA	6.62E-07	NA	2.21E-07	NA	8.41E-09	—	—	—	—	—	NA	8.92E-07
Pyrene	86	NA	3.32E-07	NA	1.11E-06	NA	8.77E-09	—	—	—	—	—	NA	1.45E-06
Organics Total Risk		**5.28E-10**	**8.25E-04**	**1.80E-09**	**1.97E-03**	**1.71E-09**	**1.09E-04**		**2.43E-05**	**2.02E-02**	**8.77E-10**	**4.02E-05**	**2.43E-05**	**2.32E-02**
Aliphatics > nC6 to nC8 (TX1006)	—	—	—	—	—	—	—	885	NA	NA	NA	8.60E-06	NA	8.60E-06
Aliphatics > nC8 to nC10 (TX1006)	—	—	—	—	—	—	—	55	NA	NA	NA	1.58E-05	NA	1.58E-05
Aromatics > nC8 to nC10 (TX1006)	—	—	—	—	—	—	—	55	NA	NA	NA	6.22E-07	NA	6.22E-07
TPH-GRO	**3,103**	**NA**	**NA**	**NA**	**1.41E-05**	**NA**	**1.83E-05**	**996**	**NA**	**NA**	**NA**	**2.50E-05**	**NA**	**5.74E-05**
Aliphatics > nC10 to nC12 (TX1006)	—	—	—	—	—	—	—	5,575	NA	NA	NA	2.38E-03	NA	2.38E-03
Aliphatics > nC12 to nC16 (TX1006)	—	—	—	—	—	—	—	5,575	NA	NA	NA	1.03E-02	NA	1.03E-02
Aliphatics > nC16 to nC21 (TX1006)	—	—	—	—	—	—	—	5,575	NA	NA	NA	9.72E-02	NA	9.72E-02
Aromatics > nC10 to nC12 (TX1006)	—	—	—	—	—	—	—	5,575	NA	NA	NA	2.87E-05	NA	2.87E-05
Aromatics > nC12 to nC16 (TX1006)	—	—	—	—	—	—	—	5,575	NA	NA	NA	1.99E-05	NA	1.99E-05
Aromatics > nC16 to nC21 (TX1006)	—	—	—	—	—	—	—	5,575	NA	NA	NA	1.51E-05	NA	1.51E-05
TPH-DRO	**177,083**	**NA**	**3.91E-04**	**NA**	**1.19E-03**	**NA**	**3.40E-04**	**33,451**	**NA**	**NA**	**NA**	**1.10E-01**	**NA**	**1.12E-01**
Aliphatics > nC21 to nC35 (TX1006)	—	—	—	—	—	—	—	75	NA	NA	NA	1.31E-03	NA	1.31E-03
Aromatics > nC21 to nC35 (TX1006)	—	—	—	—	—	—	—	75	NA	NA	NA	1.20E-07	NA	1.20E-07
TPH-ORO	—	—	—	—	—	—	—	**150**	**NA**	**NA**	**NA**	**1.31E-03**	**NA**	**1.31E-03**
TPH Total Risk		**NA**	**3.91E-04**	**NA**	**1.20E-03**	**NA**	**3.58E-04**		**NA**	**NA**	**NA**	**1.11E-01**	**NA**	**1.13E-01**

Table 7B-10(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 6B: GKN Facility, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
Arsenic	14,266	3.55E-10	5.53E-05	1.13E-07	1.75E-02	1.87E-10	2.91E-06	108	NA	NA	NA	NA	1.13E-07	1.76E-02
Barium	—	—	—	—	—	—	—	5,440	NA	NA	NA	NA	NA	NA
Cadmium	481	NA	1.12E-05	NA	3.73E-04	2.65E-12	5.90E-08	1,177	NA	NA	NA	NA	2.65E-12	3.84E-04
Chromium	—	—	—	—	—	—	—	412	NA	NA	NA	NA	NA	NA
Mercury	42	NA	1.65E-07	NA	8.23E-06	NA	1.98E-04	1.2	NA	NA	NA	3.29E-06	NA	2.10E-04
Selenium	920	NA	2.14E-05	NA	7.13E-05	NA	9.89E-07	—	—	—	—	—	NA	9.37E-05
Antimony	3,964	NA	1.15E-04	NA	3.84E-03	NA	4.26E-06	—	—	—	—	—	NA	3.96E-03
Beryllium	937	6.69E-10	5.45E-06	2.23E-10	1.82E-06	6.89E-12	1.01E-08	—	—	—	—	—	8.99E-10	7.27E-06
Cobalt	8,404	NA	4.88E-04	NA	1.63E-04	7.21E-11	9.03E-05	—	—	—	—	—	7.21E-11	7.42E-04
Copper	19,350	NA	5.62E-06	NA	1.87E-04	NA	4.14E-06	—	—	—	—	—	NA	1.97E-04
Manganese	1,084,100	NA	2.70E-03	NA	3.00E-03	NA	4.74E-03	6,400	NA	NA	NA	NA	NA	1.04E-02
Nickel	28,150	NA	8.18E-07	NA	5.45E-05	2.07E-11	3.02E-05	—	—	—	—	—	2.07E-11	8.55E-05
Zinc	52,140	NA	2.02E-06	NA	1.68E-05	NA	1.06E-08	—	—	—	—	—	NA	1.89E-05
Metals Total Risk		**1.02E-09**	**3.41E-03**	**1.13E-07**	**2.52E-02**	**2.90E-10**	**5.07E-03**		NA	NA	NA	**3.29E-06**	**1.14E-07**	**3.37E-02**
CUMULATIVE RISK		**1.55E-09**	**4.62E-03**	**1.15E-07**	**2.84E-02**	**2.00E-09**	**5.54E-03**		**2.43E-05**	**2.02E-02**	**8.77E-10**	**1.11E-01**	**2.44E-05**	**1.70E-01**

Notes:
NA: Not available
—: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
GRO: Gasoline range organic
DRO: Diesel range organic
ORO: Oil range organic
ug/L: Micrograms per liter
ug/kg: Micrograms per kilogram

Table 7C-10(a)

Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker

Sub-area 6C: GKN Facility, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc. (ug/kg)	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
		IELCR	HQ		IELCR	HQ		
2-Hexanone (MBK)	—	—	—	4.3	NA	9.83E-07	NA	9.83E-07
Acetone	55	NA	1.90E-07	—	—	—	NA	1.90E-07
cis-1,2-Dichloroethene	2.5	NA	4.48E-07	96	NA	1.05E-04	NA	1.05E-04
Dichlorodifluoromethane	3.6	NA	1.67E-06	—	—	—	NA	1.67E-06
Ethylbenzene	540	NA	7.08E-07	—	—	—	NA	7.08E-07
Methyl ethyl ketone (MEK)	13	NA	8.82E-09	—	—	—	NA	8.82E-09
Methyl isobutyl ketone	11	NA	1.02E-08	—	—	—	NA	1.02E-08
o-Xylene	600	NA	3.25E-08	—	—	—	NA	3.25E-08
Trichloroethene	4.2	1.01E-11	4.75E-07	240	1.48E-08	6.94E-04	1.48E-08	6.94E-04
Vinyl chloride	—	—	—	5.2	5.55E-08	1.82E-05	5.55E-08	1.82E-05
Xylenes, total	206	NA	3.04E-07	—	—	—	NA	3.04E-07
Chrysene	406	2.32E-15	NA	—	—	—	2.32E-15	NA
Organics Total Risk		**1.01E-11**	**3.84E-06**		**7.03E-08**	**8.18E-04**	**7.03E-08**	**8.22E-04**
Aliphatics > nC6 to nC8 (TX1006)	—	—	—	110	NA	9.05E-05	NA	9.05E-05
Aliphatics > nC8 to nC10 (TX1006)	—	—	—	47	NA	1.13E-03	NA	1.13E-03
Aromatics > nC8 to nC10 (TX1006)	—	—	—	47	NA	3.40E-05	NA	3.40E-05
TPH-GRO	**64,052**	**NA**	**2.02E-04**	**203**	**NA**	**1.25E-03**	**NA**	**1.45E-03**
Aliphatics > nC10 to nC12 (TX1006)	—	—	—	1,497	NA	5.43E-02	NA	5.43E-02
Aliphatics > nC12 to nC16 (TX1006)	—	—	—	4,641	NA	7.30E-01	NA	7.30E-01
Aliphatics > nC16 to nC21 (TX1006)	—	—	—	1,497	NA	2.22E+00	NA	2.22E+00
Aromatics > nC10 to nC12 (TX1006)	—	—	—	1,497	NA	3.20E-04	NA	3.20E-04
Aromatics > nC12 to nC16 (TX1006)	—	—	—	1,946	NA	1.59E-04	NA	1.59E-04
Aromatics > nC16 to nC21 (TX1006)	—	—	—	1,497	NA	3.16E-05	NA	3.16E-05
TPH-DRO	**566,000**	**NA**	**1.77E-04**	**12,575**	**NA**	**3.00E+00**	**NA**	**3.00E+00**

Table 7C-10(a)

Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker

Sub-area 6C: GKN Facility, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc. (ug/kg)	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
		IELCR	HQ		IELCR	HQ		
Aliphatics > nC21 to nC35 (TX1006)	—	—	—	727	NA	1.08E+00	NA	1.08E+00
Aromatics > nC21 to nC35 (TX1006)	—	—	—	295	NA	6.97E-07	NA	6.97E-07
TPH-ORO	—	—	—	**1,022**	**NA**	**1.08E+00**	**NA**	**1.08E+00**
TPH Total Risk		**NA**	**3.79E-04**		**NA**	**4.08E+00**	**NA**	**4.08E+00**
Arsenic	6,061	NA	NA	81	NA	NA	NA	NA
Barium	—	—	—	2,574	NA	NA	NA	NA
Cadmium	—	—	—	669	NA	NA	NA	NA
Chromium	27,165	NA	NA	2,381	NA	NA	NA	NA
Chromium, hexavalent	—	—	—	16	NA	NA	NA	NA
Mercury	33	NA	2.86E-05	0.76	NA	1.11E-04	NA	1.39E-04
Selenium	342	NA	NA	—	—	—	NA	NA
Metals Total Risk		**NA**	**2.86E-05**		**NA**	**1.11E-04**	**NA**	**1.39E-04**
CUMULATIVE RISK		**1.01E-11**	**4.11E-04**		**7.03E-08**	**4.08E+00**	**7.03E-08**	**4.08E+00**

Notes:

NA: Not available

—: Risk evaluation was not performed.

HI: Hazard index

TPH: Total petroleum hydrocarbon

GRO: Gasoline range organic

DRO: Diesel range organic

ORO: Oil range organic

ug/L: Micrograms per liter

ug/kg: Micrograms per kilogram

Table 7C-10(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 6C: GKN Facility, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
2-Hexanone (MBK)	—	—	—	—	—	—	—	4.3	NA	NA	NA	1.78E-07	NA	1.78E-07
Acetone	27	NA	9.36E-08	NA	9.88E-08	NA	2.32E-07	—	—	—	—	—	NA	4.25E-07
Chloroform	2.9	8.86E-14	1.02E-07	9.84E-14	1.13E-07	7.05E-12	7.13E-05	—	—	—	—	—	7.23E-12	7.15E-05
cis-1,2-Dichloroethene	3.5	NA	1.21E-08	NA	1.34E-07	NA	6.80E-07	96	NA	NA	NA	1.49E-06	NA	2.32E-06
Dichlorodifluoromethane	3.6	NA	2.09E-08	NA	6.97E-09	NA	4.76E-07	—	—	—	—	—	NA	5.04E-07
Ethylbenzene	233	NA	8.13E-07	NA	8.31E-07	NA	7.27E-07	—	—	—	—	—	NA	2.37E-06
Methyl ethyl ketone (MEK)	12	NA	7.20E-09	NA	8.00E-09	NA	2.79E-08	—	—	—	—	—	NA	4.31E-08
Methyl isobutyl ketone	12	NA	5.42E-08	NA	6.02E-08	NA	1.14E-07	—	—	—	—	—	NA	2.29E-07
o-Xylene	600	NA	3.49E-07	NA	1.16E-07	NA	5.87E-07	—	—	—	—	—	NA	1.05E-06
Trichloroethene	29	2.69E-15	2.85E-09	1.79E-12	1.90E-06	3.90E-12	4.58E-06	240	1.33E-08	1.42E-02	5.19E-12	6.09E-06	1.34E-08	1.42E-02
Vinyl chloride	—	—	—	—	—	—	—	5.2	2.28E-08	2.80E-04	1.41E-11	1.16E-07	2.28E-08	2.80E-04
Xylenes, Total	90	NA	1.57E-08	NA	1.61E-08	NA	3.59E-07	—	—	—	—	—	NA	3.91E-07
Benzo(a)anthracene	66	1.04E-10	NA	2.67E-10	NA	1.18E-12	NA	—	—	—	—	—	3.73E-10	NA
Benzo(b)fluoranthene	48	7.54E-11	NA	1.93E-10	NA	6.48E-13	NA	—	—	—	—	—	2.69E-10	NA
Chrysene	274	4.32E-12	NA	1.11E-11	NA	6.38E-14	NA	—	—	—	—	—	1.54E-11	NA
Fluoranthene	84	NA	2.45E-07	NA	4.08E-07	NA	6.39E-09	—	—	—	—	—	NA	6.59E-07
Organics Total Risk		**1.84E-10**	**1.71E-06**	**4.74E-10**	**3.69E-06**	**1.28E-11**	**7.90E-05**		**3.61E-08**	**1.44E-02**	**1.93E-11**	**7.88E-06**	**3.68E-08**	**1.45E-02**
Aliphatics > nC6 to nC8 (TX1006)	—	—	—	—	—	—	—	110	NA	NA	NA	5.68E-07	NA	5.68E-07
Aliphatics > nC8 to nC10 (TX1006)	—	—	—	—	—	—	—	47	NA	NA	NA	7.06E-06	NA	7.06E-06
Aromatics > nC8 to nC10 (TX1006)	—	—	—	—	—	—	—	47	NA	NA	NA	2.78E-07	NA	2.78E-07
TPH-GRO	**45,807**	**NA**	**NA**	**NA**	**2.08E-04**	**NA**	**2.70E-04**	**203**	**NA**	**NA**	**NA**	**7.91E-06**	**NA**	**4.86E-04**
Aliphatics > nC10 to nC12 (TX1006)	—	—	—	—	—	—	—	1,497	NA	NA	NA	3.41E-04	NA	3.41E-04
Aliphatics > nC12 to nC16 (TX1006)	—	—	—	—	—	—	—	4,641	NA	NA	NA	4.57E-03	NA	4.57E-03
Aliphatics > nC16 to nC21 (TX1006)	—	—	—	—	—	—	—	1,497	NA	NA	NA	1.39E-02	NA	1.39E-02
Aromatics > nC10 to nC12 (TX1006)	—	—	—	—	—	—	—	1,497	NA	NA	NA	4.09E-06	NA	4.09E-06
Aromatics > nC12 to nC16 (TX1006)	—	—	—	—	—	—	—	1,946	NA	NA	NA	3.67E-06	NA	3.67E-06
Aromatics > nC16 to nC21 (TX1006)	—	—	—	—	—	—	—	1,497	NA	NA	NA	2.12E-06	NA	2.12E-06
TPH-DRO	**1,049,429**	**NA**	**2.31E-03**	**NA**	**7.04E-03**	**NA**	**2.01E-03**	**12,575**	**NA**	**NA**	**NA**	**1.88E-02**	**NA**	**3.02E-02**
Aliphatics > nC21 to nC35 (TX1006)	—	—	—	—	—	—	—	727	NA	NA	NA	6.75E-03	NA	6.75E-03
Aromatics > nC21 to nC35 (TX1006)	—	—	—	—	—	—	—	295	NA	NA	NA	2.25E-07	NA	2.25E-07
TPH-ORO	—	—	—	—	—	—	—	**1,022**	**NA**	**NA**	**NA**	**6.75E-03**	**NA**	**6.75E-03**
TPH Total Risk		**NA**	**2.31E-03**	**NA**	**7.25E-03**	**NA**	**2.28E-03**		**NA**	**NA**	**NA**	**2.56E-02**	**NA**	**3.74E-02**

Table 7C-10(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 6C: GKN Facility, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
Arsenic	5,817	1.45E-10	2.25E-05	4.59E-08	7.14E-03	7.63E-11	1.19E-06	81	NA	NA	NA	NA	4.61E-08	7.16E-03
Barium	---	---	---	---	---	---	---	2,574	NA	NA	NA	NA	NA	NA
Cadmium	425	NA	9.87E-06	NA	3.29E-04	2.34E-12	5.20E-08	669	NA	NA	NA	NA	2.34E-12	3.39E-04
Chromium	19,798	NA	NA	NA	NA	7.28E-10	NA	2,381	NA	NA	NA	NA	7.28E-10	NA
Chromium, hexavalent	---	---	---	---	---	---	---	16	NA	NA	NA	NA	NA	NA
Mercury	38	NA	1.48E-07	NA	7.39E-06	NA	1.78E-04	0.76	NA	NA	NA	1.14E-06	NA	1.87E-04
Selenium	329	NA	7.65E-06	NA	2.55E-05	NA	3.54E-07	---	---	---	---	---	NA	3.35E-05
Metals Total Risk		**1.45E-10**	**4.02E-05**	**4.59E-08**	**7.50E-03**	**8.06E-10**	**1.00E-04**		**NA**	**NA**	**NA**	**1.14E-06**	**4.68E-08**	**7.72E-03**
CUMULATIVE RISK		**3.29E-10**	**2.36E-03**	**4.64E-08**	**1.47E-02**	**8.19E-10**	**2.54E-03**		**3.61E-08**	**1.44E-02**	**1.93E-11**	**2.56E-02**	**8.36E-08**	**5.97E-02**

Notes:
NA: Not available
---: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
GRO: Gasoline range organic
DRO: Diesel range organic
ORO: Oil range organic
ug/L: Micrograms per liter
ug/kg: Micrograms per kilogram

Table 7D-10(a)

Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker

Sub-area 6D: GKN Facility, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ		IELCR	HQ		
Dichlorodifluoromethane	5.5	NA	8.16E-06	---	---	---	NA	8.16E-06
Tetrachloroethene	---	---	---	12	2.99E-10	3.60E-06	2.99E-10	3.60E-06
Toluene	39	NA	7.99E-07	---	---	---	NA	7.99E-07
Organics Total Risk		**NA**	**8.96E-06**		**2.99E-10**	**3.60E-06**	**2.99E-10**	**1.26E-05**
TPH-GRO	12,000	NA	1.23E-04	---	---	---	NA	1.23E-04
TPH-DRO	2,500	NA	2.52E-06	---	---	---	NA	2.52E-06
TPH-ORO	2,500	NA	6.38E-08	---	---	---	NA	6.38E-08
TPH Total Risk		**NA**	**1.25E-04**		**NA**	**NA**	**NA**	**1.25E-04**
Arsenic	---	---	---	8.9	NA	NA	NA	NA
Chromium	---	---	---	41	NA	NA	NA	NA
Metals Total Risk		**NA**	**NA**		**NA**	**NA**	**NA**	**NA**
CUMULATIVE RISK		**NA**	**1.34E-04**		**2.99E-10**	**3.60E-06**	**2.99E-10**	**1.38E-04**

Notes:

NA: Not available

---: Risk evaluation was not performed.

HI: Hazard index

TPH: Total petroleum hydrocarbon

GRO: Gasoline range organic

DRO: Diesel range organic

ORO: Oil range organic

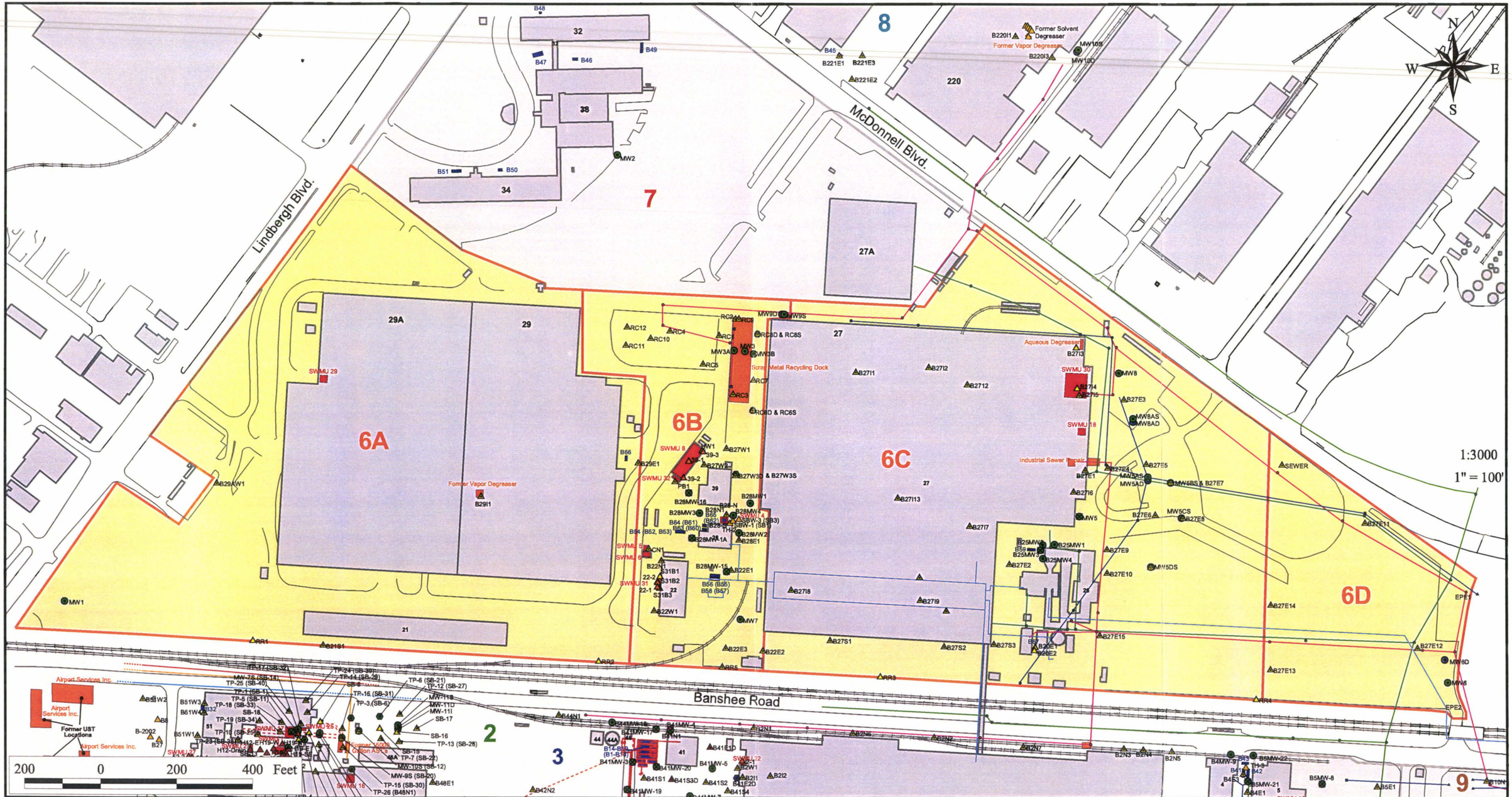
ug/L: Micrograms per liter

ug/kg: Micrograms per kilogram

Table 7D-10(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 6D: GKN Facility, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
Dichlorodifluoromethane	5.5	NA	3.17E-08	NA	1.06E-08	NA	7.20E-07	—	—	—	—	—	NA	7.63E-07
Methyl ethyl ketone (MEK)	69	NA	3.98E-08	NA	4.42E-08	NA	1.54E-07	—	—	—	—	—	NA	2.38E-07
Tetrachloroethene	—	—	—	—	—	—	—	12	9.19E-09	1.24E-03	1.22E-13	3.68E-08	9.19E-09	1.24E-03
Toluene	27	NA	4.66E-09	NA	5.18E-08	NA	2.94E-07	—	—	—	—	—	NA	3.50E-07
Organics Total Risk		**NA**	**7.62E-08**	**NA**	**1.07E-07**	**NA**	**1.17E-06**		**9.19E-09**	**1.24E-03**	**1.22E-13**	**3.68E-08**	**9.19E-09**	**1.24E-03**
TPH-GRO	12,000	NA	NA	NA	5.46E-05	NA	7.07E-05	—	—	—	—	—	NA	1.25E-04
TPH-DRO	2,500	NA	5.51E-06	NA	1.68E-05	NA	4.80E-06	—	—	—	—	—	NA	2.71E-05
TPH-ORO	2,500	NA	6.37E-06	NA	1.64E-05	NA	5.16E-07	—	—	—	—	—	NA	2.33E-05
TPH Total Risk		**NA**	**1.19E-05**	**NA**	**8.77E-05**	**NA**	**7.60E-05**		**NA**	**NA**	**NA**	**NA**	**NA**	**1.76E-04**
Arsenic	9,250	2.30E-10	3.58E-05	7.30E-08	1.13E-02	1.21E-10	1.89E-06	8.9	NA	NA	NA	NA	7.33E-08	1.14E-02
Chromium	—	—	—	—	—	—	—	41	NA	NA	NA	NA	NA	NA
Metals Total Risk		**2.30E-10**	**3.58E-05**	**7.30E-08**	**1.13E-02**	**1.21E-10**	**1.89E-06**		**NA**	**NA**	**NA**	**NA**	**7.33E-08**	**1.14E-02**
CUMULATIVE RISK		**2.30E-10**	**4.78E-05**	**7.30E-08**	**1.14E-02**	**1.21E-10**	**7.91E-05**		**9.19E-09**	**1.24E-03**	**1.22E-13**	**3.68E-08**	**8.25E-08**	**1.28E-02**

Notes:
NA: Not available
—: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
GRO: Gasoline range organic
DRO: Diesel range organic
ORO: Oil range organic
ug/L: Micrograms per liter
ug/kg: Micrograms per kilogram



Legend

- Abandoned Shallow Piezometer
- Abandoned Shallow Well
- Deep Piezometer
- Deep Well
- Intermediate Well
- Other Shallow Boring
- RFA Boring
- RCRA Closure Shallow Boring
- RFI Deep Boring/Temp. Piezometer
- RFI Shallow Boring
- RFI Shallow Boring/Temp. Piezometer
- Shallow Piezometer
- Shallow Well
- UST Closure Sample
- Other Area
- UST
- SWMU
- Industrial Sewer Line
- Sanitary Sewer Line
- Steam Line
- Storm Sewer Line
- Jet Fuel Line
- Natural Gas Line
- Water Line
- Abandoned Fuel Line
- Manhole (Type by Color)
- Storm Sewer Intake
- Storm Sewer Outlet

Drawn by: BSM Approved by:

Checked by: Date: September 13, 2004

Risk Assessement & Management Group, Inc.

Figure 7-1
Exposure Area 6:
Sub Areas: 6A, 6B, 6C, 6D
GKN Facility,
Boeing Tract 1 North

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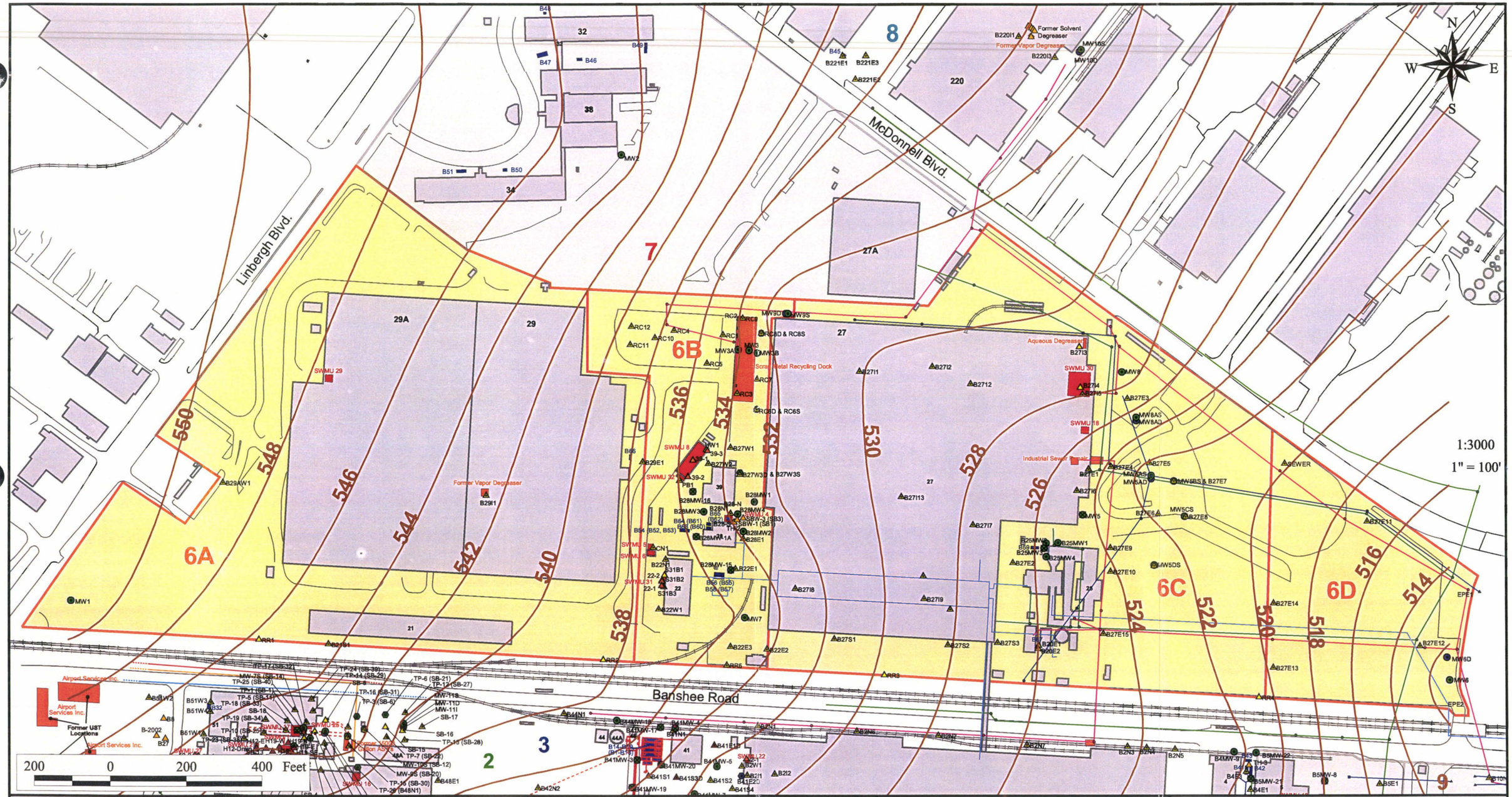

Legend

- Abandoned Shallow Piezometer
- Abandoned Shallow Well
- Deep Piezometer
- Deep Well
- Intermediate Well
- Other Shallow Boring
- RFA Boring
- RCRA Closure Shallow Boring
- RFI Deep Boring/Temp. Piezometer
- RFI Shallow Boring
- RFI Shallow Boring/Temp. Piezometer
- Shallow Piezometer
- Shallow Well
- UST Closure Sample
- Other Area
- UST
- SWMU
- Industrial Sewer Line
- Sanitary Sewer Line
- Steam Line
- Storm Sewer Line
- Jet Fuel Line
- Shallow Groundwater Isopleth
- Natural Gas Line
- Water Line
- Abandoned Fuel Line
- Manhole (Type by Color)
- Storm Sewer Intake
- Storm Sewer Outlet

Drawn by: BSM Approved by:

Checked by: Date: September 13, 2004

Risk Assessment & Management Group, Inc.

Figure 7-2
Shallow Groundwater Isopleth Map for Area 6: GKN Facility, Boeing Tract 1 North

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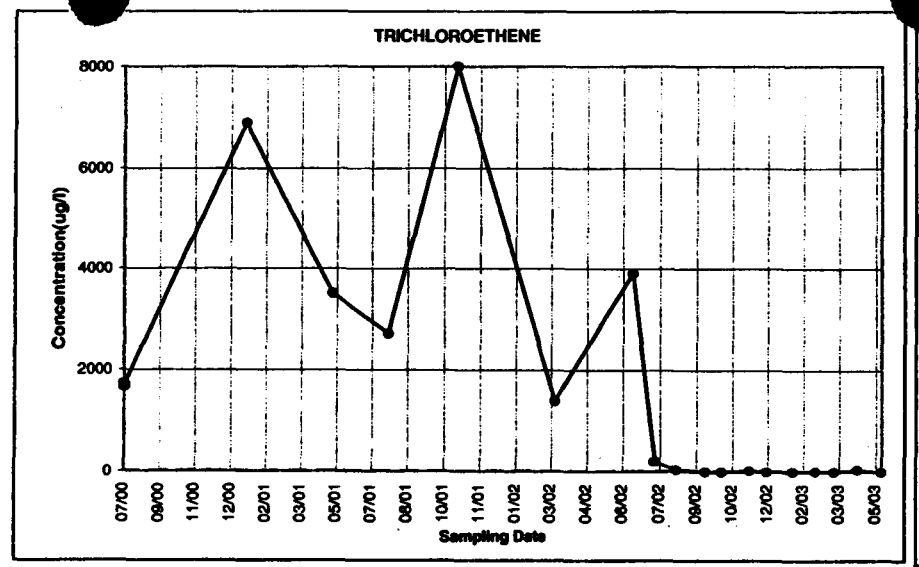
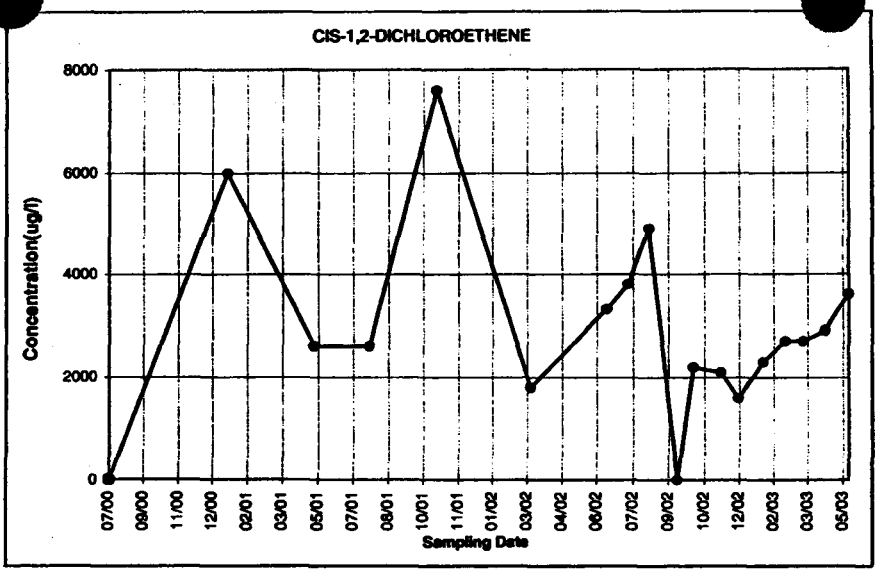
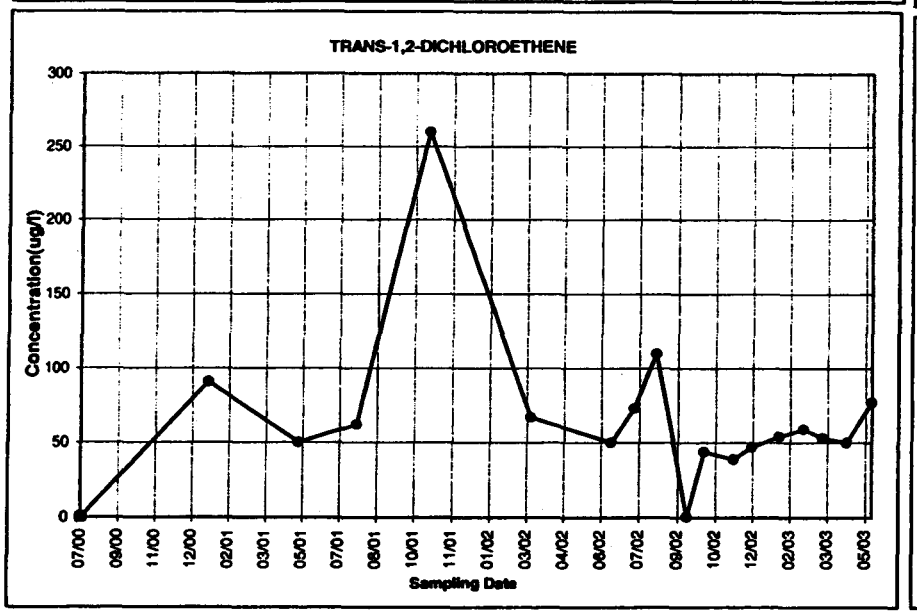
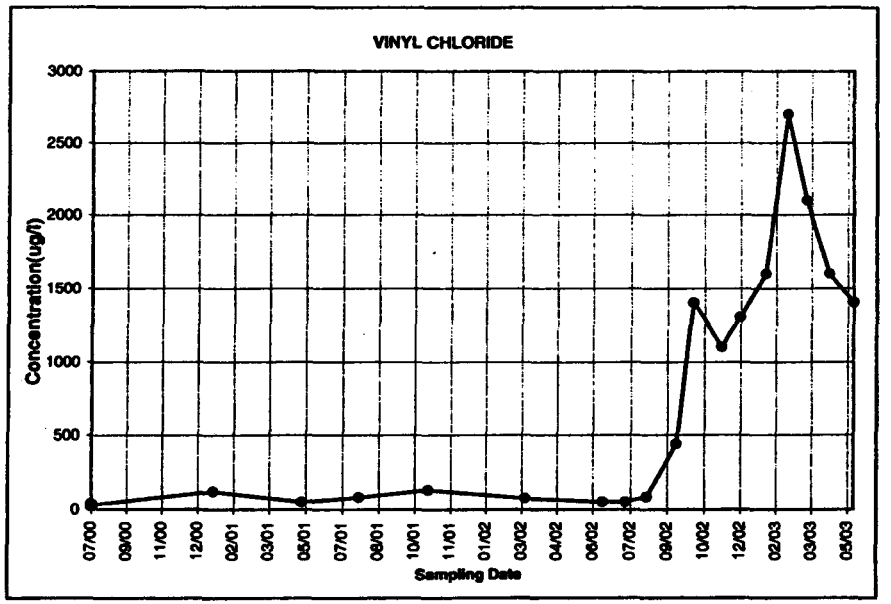


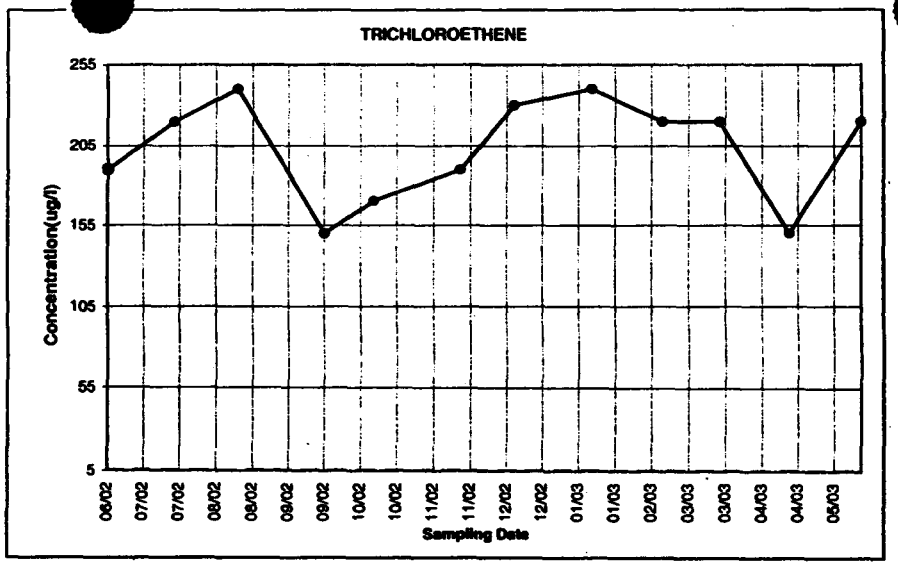


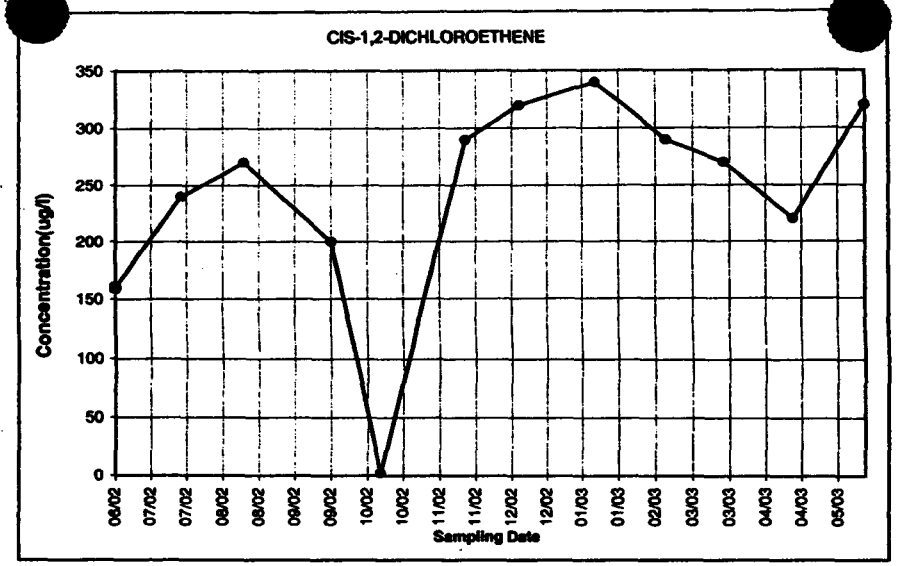


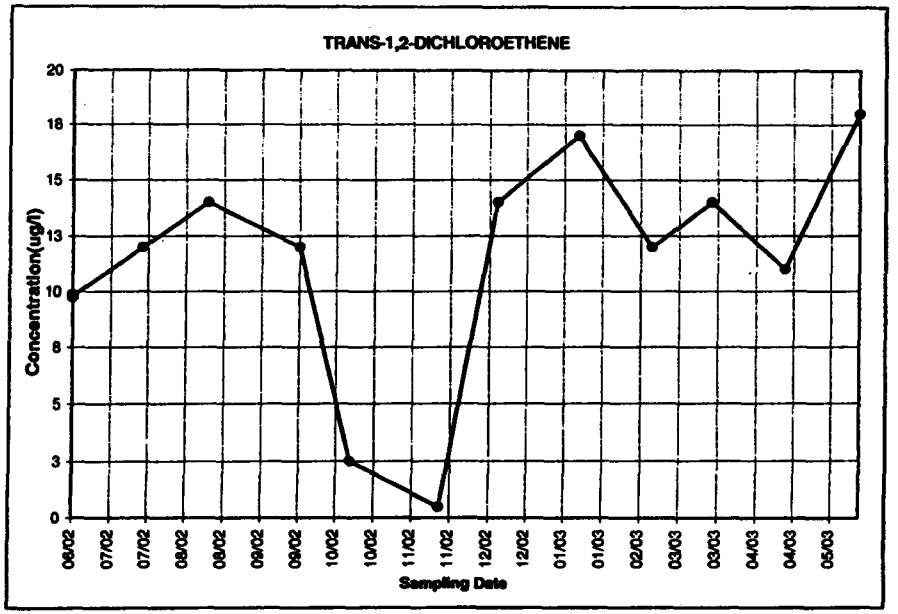


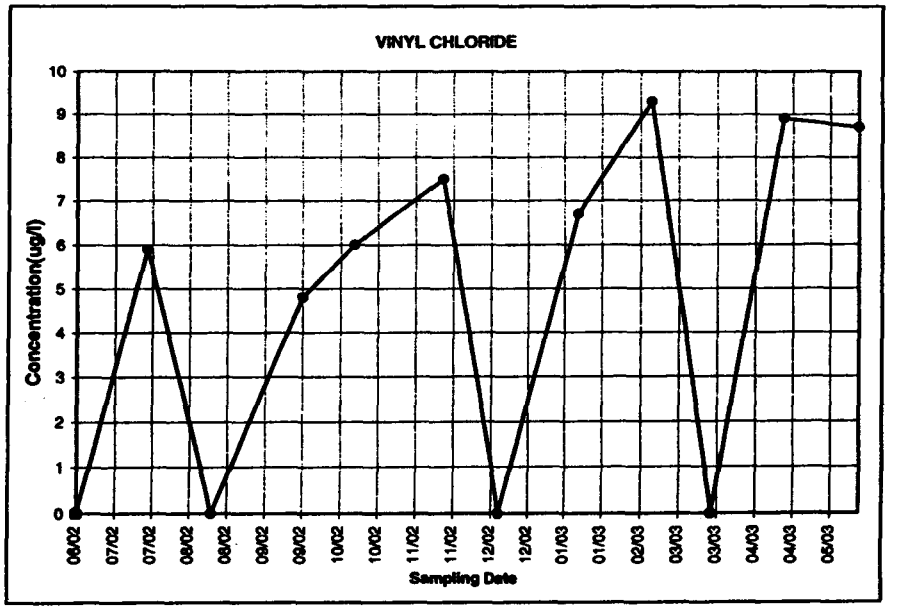
NA is assumed as zero concentration

Figure 7-3. Groundwater Data Collected at MW3W-N
Sub-area 6B: GKN Facility, Boeing Tract 1, St. Louis, Missouri









ND is assumed as zero concentration

Figure 7-4. Groundwater Data Collected at MW3AW-N
Sub-area 6B: GKN Facility, Boeing Tract 1, St. Louis, Missouri

ATTACHMENT 7-A

ECOLOGICAL RISK ASSESSMENT – AREA 6 GKN FACILITY
TIER 1 SCREENING CHECKLIST FOR POTENTIAL RECEPTORS AND HABITAT
CHECKLIST #1

1. Is the site less than ½ mile to a surface water resource (pond, river, lake, etc.)?

   Yes, the downgradient edge of Area 6D is adjacent to Coldwater Creek.

2. Are wetlands (e.g. marshes, swamps, fens) on or adjacent to the site?

   No.

3. Are contaminated soils uncovered or otherwise accessible to ecological receptors and the elements?

   No, the entire site is paved.

4. Has a process (operational) discharge or storm water permit not been issued for the site?

   Site-wide, there is a storm water permit.

5. Is the site located in a known Karst environment (see Reference map)?

   No.

6. Are there federal or state rare, threatened, or endangered species on or within a ½ mile radius of the site? Note, the ½ mile radius limit does not necessarily apply to situations where a hydrogeological connection exists between the site and karsitic features.

   No.

7. Are there one or more environmentally sensitive areas (see Ecological Risk Assessment Figure #1 for definition) at or within a ½ mile radius of the site?

   No.

8. Are commercially or recreationally important species (fauna or flora) on or within a ½ mile radius of the site?

   No.

ATTACHMENT 7-B

ECOLOGICAL RISK ASSESSMENT
TIER 1 SCREENING CHECKLIST FOR POTENTIAL RECEPTORS AND HABITAT
CHECKLIST #2

1a. Can contaminants associated with the site leach, dissolve, or otherwise migrate to groundwater?

Yes, groundwater has been impacted.

1b. Are contaminants associated with the site mobile in groundwater?

Yes.

1c. Does groundwater from the site discharge into to ecological receptor habitat?

Eventually groundwater discharges into Coldwater Creek.

1. Could contaminants associated with the site reach ecological receptors via groundwater?

Based on the distance to the creek and the current groundwater concentrations, there is some potential for low level dissolved impacts in groundwater to reach the creek.

2a. Is NAPL present at the site?

No.

2b. Is NAPL migrating?

No.

2c. Could NAPL discharge occur where ecological receptors are found?

No.

2. Could contaminants from the site reach ecological receptors via migration of NAPL?

No.

3a. Are contaminants present in surface soils?

Although we have no surficial soil data, it is unlikely based on the sources located within this area that surficial soil is impacted.

3b. Can contaminants be leached from or be transported by erosion of surface soils?

No, the site is entirely paved.

3. Could contaminants reach ecological receptors via erosional transport of contaminated soil or via precipitation runoff?

No, the site is entirely paved.

4a. Are contaminants present in surface soil or on the surface of the ground?

No.

4b. Are potential ecological receptors on the site?

No.

4. Could contaminants reach ecological receptors via direct contact?

No, the site is entirely paved.

5a. Are contaminants present on the site volatile?

Yes.

5b. Could contaminants on the site be transported in air as dust or particulate matter?

No, the site is entirely paved.

5. Could contaminants reach ecological receptors via inhalation of volatilized contaminants or contaminants adhered to dust in ambient air or in subsurface burrows?

No, the site is entirely paved.

6a. Are contaminants present in surface and shallow subsurface soils or on the surface of the ground?

No.

6b. Are contaminants found in soil on the site taken up by plants growing on the site?

No, the site is entirely paved.

6c. Do potential ecological receptors on or near the site feed on plants found on the site?

No, the site is entirely paved.

6d. Do contaminants found on the site bioaccumulate?

No.

6. Could contaminants reach ecological receptors via ingestion of either soil, plants, animals, or contaminants directly?

No.

7a. Are there Karsitic features on or within a ½ mile radius of the site?

No.

7b. Is there a hydrogeological connection between the site and karsitic features such as seeps, springs, streams, or other surface water bodies?

No.

7. Could contaminants reach ecological receptors via transport through a Karst system?

No.

Section
8.0

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8.1 INTRODUCTION

The Engineering Campus (Area 7) is located in the northern portion of the Facility, bordered by Lindbergh Boulevard to the west and James S. McDonnell Boulevard to the north, see Figure 8-1. This section will describe the constituents found in this Area, the exposure model, the evaluation of the current and future risk to human health and the environment, and conclusions based on the results of the risk evaluation.

8.2 DESCRIPTION OF AREA

The Engineering Campus is approximately 1,500 feet long by 1,000 feet wide (at its maximum dimensions). Within this Area are four buildings and large parking lots. Other than the buildings, the entire area is paved.

8.2.1 Potential Sources within Area

No SWMU's were located within this Area; however, six USTs were previously located within this Area near the three main buildings (32, 33, and 34) (see Table 8-1 for details). Two of the six USTs listed on Table 8-1 replaced previous 300-gallon USTs in 1960 and 1975. The USTs ranged in size from 300 gallons to 20,000 gallons, and contained gasoline, fuel oil, and diesel. Two of the tanks were used for boiler fuel and the others were used to fuel emergency power generators.

These USTs were all removed via excavation in 1989, and were not replaced. The tanks were removed following McDonnell Douglas environmental department guidelines that included an inspection of the excavation with further action initiated if contamination was visually observed. No further action was required at any of the six locations. Upon removal of the tanks, no soil sampling activities were performed.

At various times since the removal of the tanks, different projects involving utility repair or replacement have been conducted at the former tank locations. Testing of the soil was conducted during these projects to assist with proper soil disposal. It is standard Boeing procedure to field test with a Photoionization Detector (PID) meter any soil being disturbed or removed during construction projects or emergency repairs. Testing involves collecting several samples from every three to four cubic yards of excavated soil. The samples are composited into a sealed plastic bag and a PID measurement is taken from the headspace. Laboratory analysis is conducted if a PID measurement above 50 ppm is detected. Listed below is a description of the tanks with PID readings and dates of tests. No VOCs above 5 ppm were detected with the PID meter at these former UST sites.

Tank No.	Tank Location	Material	Gallons	Installation Date	PID Test Date	PID Location	PID Results
B46	33A	Diesel	300/3,000	1956/1960	6/26/00	At UST site	5 ppm
B47	33B	Fuel Oil	20,000	1956	11/13/01	20 feet west of UST	3 ppm
B48	32A	Gasoline	300/500	1956/1975	5/16/03	10 feet north of UST	<1 ppm
B49	32B	Fuel Oil	10,000	1955	4/27/00	At UST site	5 ppm
B50	34A	Diesel	850	1957	4/21/03	At UST site	< 1 ppm
B51	34B	Fuel Oil	10,000	1957	4/21/03	At UST site	< 1 ppm

ppm: parts per million

Based on the past and current use of the Area, soil or groundwater impact beyond background levels would not be expected, with the possible exception of petroleum hydrocarbons.

8.2.2 Soil Stratigraphy within Area

There is one boring in this Area, in which monitoring well MW2 was installed. Based on the soil boring log for MW2, the soil stratigraphy is silty clay, clayey silt, and silt from 0.5 feet below ground surface (bgs) to approximately 19 feet bgs (total depth advanced). This is similar to the overall site soil stratigraphy. For additional details, refer to the RFI (MACTEC, 2004).

8.2.3 Hydrogeology within Area

There is one monitoring well (MW2) located within this Area, with 10 feet of screen from 8 to 18 feet bgs, see Table 8-2 for further details of this well. Groundwater flow within this Area in the shallow zone is to the east, based on recent gauging data and information from wells just outside this Area (Figure 8-2). The depth to shallow groundwater in MW2 is approximately 5 feet bgs.

8.3 LAND USE

8.3.1 Current Land Use

Currently, the Area is commercial with office space occupied by Boeing. The remainder of the Area is paved parking lot. Area 7 includes office buildings #32, 33, 34, and manufacturing building #27A.

8.3.2 Future Land Use

Boeing plans to retain the office complex for use as commercial office space in the future, and the parking lots are anticipated to remain.

8.4 AVAILABLE DATA

The following gives an overview of the available data within this Area:

- One monitoring well (MW2) is located within this Area, and this well has been sampled eight times from July 2000 to June 2003;
- At the time of installation of MW2 in July 2000, a soil sample was collected. This is the only laboratory analyzed soil data within this Area;
- No piezometers were installed within this Area;
- No soil data is available from the UST excavation activities completed in 1989, other than visual observations; and
- Soil PID data is available for various construction activities that occurred near the USTs between April 2000 and May 2003.

8.5 CONSTITUENTS IDENTIFIED WITHIN AREA

8.5.1 Soil

One soil sample was collected in this Area from the boring used to install monitoring well MW2, in July 2000. This sample was analyzed for a comprehensive list of 67 constituents that included VOCs, PAHs, PCBs, TPH, metals, and cyanide. Typical laboratory methods that were used for analysis include SW 846 Methods 6010, 7471, 8015, 8082, 8260, 8310, and 9012. Available data is included in Table H-1 in Appendix H.

Table 8-3 lists the constituents detected in the soil sample. In all, six metals were detected: arsenic, barium, cadmium, chromium, lead, and mercury. These metals are naturally occurring and at concentrations below background levels (Refer Table 8-4). Therefore, these detected metals were not considered further.

Two metals (selenium and silver) were not detected, but had DLs that exceeded the background levels. The selenium DL was <650 ug/kg vs. a background concentration of 260 ug/kg. The silver DL was <1,300 ug/kg vs. a background concentration of <700 ug/kg. However, the DLs for selenium and silver did not exceed the high end of the range of concentrations observed that were used to establish the background concentrations (100 ug/kg – 2,300 ug/kg for selenium and 700 ug/kg – 3,000 ug/kg for silver). There are no known sources for these metals, and no known industrial activity that would have released these metals in this Area. It is our opinion that these metals are not present above background levels, and the elevated DLs represent laboratory or natural variability. Therefore, these non-detected metals were not considered further.

One organic compound - methyl ethyl ketone (MEK) had a "J"-flagged concentration of 0.0089 mg/kg. "J"-flagged values are estimated concentrations below the DL; therefore, MEK is considered non-detect, and there was no corresponding concentration observed in groundwater. Therefore, MEK was not considered further in the risk assessment.

Thus, no constituents were considered for quantitative risk evaluation for soil.

8.5.2 Groundwater

One groundwater monitoring well (MW2) is located within Area 7, and has been sampled eight times between July 2000 and June 2003, see Table 8-5. In all, these samples were analyzed for

one hundred ten constituents consisting of VOCs, PAHs, PCBs, TPH, metals, and cyanide. Typical methods used included SW 846 Methods 6010, 7470, 8015, 8082, 8260, 8310, and 9012. Available data is included in Table H-2 in Appendix H. Table H-3 in Appendix H presents the range of DLs for the constituents that had no positive detects in groundwater.

Of the constituents analyzed, nine were detected in at least one sample: arsenic, barium, benzene, chromium, cis-1,2-dichloroethene, lead, mercury, selenium, and toluene. These constituents were not considered further in the risk assessment for the following reasons:

- Arsenic had two detects and one non-detect DL above the MCL, but two subsequent sampling events were below the MCL.
- Barium, benzene, cis-1,2-dichloroethene, mercury, and toluene were below their respective MCLs.
- Chromium exceeded the MCL in the 2000 sampling event but was below the MCL on four subsequent sampling events including the last two, which were non-detect.
- Lead was detected above the MCL in the 2000 sampling event and was non-detectable with a DL that exceeded the MCL in the January 2001 sampling event; but the subsequent three sampling events were below the MCL including the last two, which were non-detectable.
- Selenium had one non-detect sample with a DL above the MCL, but it also had a detectable concentration in another sampling event from the same well that was $1/10^{th}$ the MCL.

Sixty-four constituents were non-detectable, and their highest DLs did not exceed any target level criteria. These constituents were not considered further in the risk assessment.

There were 12 constituents consisting of VOCs and TPH that were not detected and did not have any target level criteria for comparison. The DLs were<5 ug/L for VOCs except 2-hexanone (<10 ug/L), acrolein (<50 ug/L), chloromethane (<10 ug/L), and iodomethane (<10 ug/L), and <500 ug/L for TPH. These constituents were not considered further in the risk assessment.

Eleven constituents (1 metal, 2 VOCs, 1 PAH, and 7 aroclors) were non-detectable, but their DLs exceeded their specific MCLs. These constituents were not considered further in the risk assessment for the following reasons:

- Cadmium and vinyl chloride were non-detectable and the DLs were below the MCLs in the subsequent sampling events.
- 1,2-Dibromo-3-chloropropane (DL range of 2-5 ug/L) is not associated with petroleum hydrocarbons and does not have known sources or industrial activity that could have released this constituent in this Area.
- Benzo(a)pyrene was non-detect at 5 ug/L in the one sampling event for PAHs, and all other PAHs were also non-detectable.
- Seven aroclors (PCBs) were analyzed in one sampling event. All were non-detectable; however, the DLs (<1.1 ug/L) for each exceeded the non-specific PCB MCL (0.5 ug/L). These PCBs are not associated with petroleum hydrocarbons and do not have known sources nor industrial activity that could have released these constituents in this Area.

Four VOCs were non-detectable, but their DLs exceeded the EPA HA concentrations for groundwater. These constituents were not considered further in the risk assessment for the following reasons:

- Hexachlorobutadiene was non-detectable in five subsequent sampling events and the DLs did not exceed the HA; and
- The HA for 1,1,2,2-tetrachloroethane was exceeded in all seven samples, and also in all six samples for 1,2-dibromoethane, both with DLs of 1-5 ug/L. Also, acrylonitrile was non-detectable and its DL (<50 ug/L) exceeded the HA in all six sampling events. All three do not have known sources or industrial activity that could have released these constituents in this Area.

Ten constituents (6 VOCs and 4 PAHs) were non-detectable, but their DLs exceeded the calculated risk-based groundwater ingestion target level. These constituents were not considered further in the risk assessment for the following reasons:

- Four VOCs (1,1-dichloropropene, 1,2,4-trimethylbenzene, 2,2-dichloropropane, and trans-1,3-dichloropropene) were also non-detectable during the six subsequent sampling events with DLs below their respective risk-based groundwater ingestion target level concentrations.
- MIBK (VOC) was non-detectable during two earlier sampling events with DLs below the risk-based groundwater ingestion target level. This suggests that although during subsequent sampling events where DLs exceeded the risk-based groundwater ingestion target level, it is unlikely that MIBK is present above its risk-based groundwater ingestion target level.
- Another VOC, 2-chloroethyl vinyl ether was non-detectable at 50 ug/L during six sampling events and the DL exceeded its risk-based groundwater ingestion target level. This VOC does not have known sources or industrial activity that could have released this constituent in this Area.
- Four PAHs (benzo(a)anthracene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-CD)pyrene) were non-detect at 5 ug/L, which exceeded their respective risk-based groundwater ingestion target levels during one sampling event for PAHs, and all other PAHs were also non-detectable.

Based on the above evaluation and the lack of industrial activities in this Area, no constituents were considered for quantitative risk evaluation for groundwater.

8.6 EXPOSURE MODEL

8.6.1 Current conditions

This Area is comprised of office buildings and parking lots. Hence, the receptors under current conditions would be the non-residential worker and a visitor/maintenance worker to the Area.

Exhibit 8-1 presents the EM for the current non-residential worker. As the exposure duration for the visitor/maintenance worker is less than that for the non-residential worker, the risk from any soil or groundwater impact will not be quantitatively evaluated.

EXHIBIT 8-1. EM FOR CURRENT ON-SITE NON-RESIDENTIAL WORKER		
Scenario, Receptor, and Pathways / Routes Analyzed	**C or NC**	**Justification**
Dermal Contact with Surficial Soil	NC	The Area is entirely paved; therefore, contact with surficial soil is unlikely. Also, the only sources located within this Area were USTs, and impact is not expected in the surficial zone.
Ingestion of Surficial Soil	NC	The Area is entirely paved; therefore, ingestion of surficial soil is unlikely. Also, the only sources located within this Area were USTs, and impact is not expected in the surficial zone.
Indoor Inhalation of Vapors from Subsurface Soil	NC	No volatile constituents were detected in soils in this Area; therefore, this pathway is incomplete.
Indoor Inhalation of Vapors from Groundwater	NC	No volatile constituents were detected above the MCLs in groundwater in this Area; therefore, this pathway is incomplete.
Notes: **NC:** Not Complete **C:** Complete Exposure pathways highlighted in bold indicate that these pathways are complete and will be quantitatively evaluated.		

8.6.2 Future conditions

Under future conditions, the land use in this Area is not expected to alter; hence, the receptors will remain the same in the future. As such, they will not be quantitatively evaluated as the comparison for the current conditions will be protective of the future non-residential worker. Groundwater concentrations are expected to decrease in the future through natural attenuation processes, further reducing the risk.

In the future, construction work could be performed within this Area; however, no evidence of impacted soils has been noted based on field screening during numerous past construction activities in this Area. However, if there are any localized impacts, the concentrations are unlikely to exceed the risk to a construction worker.

8.7 CALCULATION OF RISK

No quantitative evaluation is necessary for this Area.

8.8 ECOLOGICAL RISK

The Tier 1 ecological screening checklists have been completed for this Area, and are presented as Attachment 8-A and Attachment 8-B. These checklist identified no potential ecological receptors or issues.

8.9 CONCLUSIONS

The only complete pathway for this Area is contact with soil for the potential future construction worker. This pathway has not been quantitatively evaluated as no evidence of soil impacts have been noted based on field screening during several past construction activities in this Area. We do not consider that additional sampling is necessary in order to quantitate this risk for the following reasons:

- Any impacts will be localized, and the concentrations likely to be observed are unlikely to exceed the risk to a construction worker, as a result of the limited exposure frequency and exposure duration for a construction worker;
- When the USTs were removed, although no sampling was conducted, no evidence of soil contamination was observed. Also, pictorial evidence suggests that the USTs were in good condition with no holes observed;
- Since the USTs were removed in 1989, the areas have been excavated a number of times for utility work, and the soils screened using a PID; and at each event, no elevated levels of petroleum hydrocarbons have been observed;
- No major construction work is planned in this Area to alter the locations of the office buildings; and
- As discussed in Section 8.2.1, it is Boeing's standard procedure to field test with a PID meter soil being disturbed or removed during construction projects or emergency repairs, and to perform subsequent actions if elevated PID readings above a certain threshold are recorded.

TABLE 8-1
SUMMARY OF UNDERGROUND STORAGE TANKS (USTs) PRESENT HISTORICALLY WITHIN AREA 7: ENGINEERING CAMPUS
BOEING TRACT 1, ST. LOUIS, MISSOURI

UST Number	Location	Volume (Gallons)	Contents	Construction Material	Year Installed	Status	Comments
B46	Bldg. 33A	3,000	Diesel	Single Wall Steel	1960	Removed 1989	Excavated
B47	Bldg.33B	20,000	Fuel Oil	Single Wall Steel	1956	Removed 1989	Excavated
B48	Bldg. 32A	500	Gasoline	Single Wall Steel	1975	Removed 1989	Excavated
B49	Bldg. 32B	10,000	Fuel Oil	Single Wall Steel	1955	Removed 1989	Excavated
B50	Bldg. 34A	850	Diesel	Single Wall Steel	1957	Removed 1989	Excavated
B51	Bldg. 34B	10,000	Fuel Oil	Single Wall Steel	1957	Removed 1989	Excavated

Notes:
UST B-46 replaced an earlier 300-gallon steel UST that contained diesel. The previous UST was installed in 1956 and replaced in 1960.
UST B-48 replaced an earlier 300-gallon steel UST that contained gasoline. The previous UST was installed in 1956 and was replaced in 1975.

TABLE 8-2
MONITORING WELL INFORMATION FOR AREA 7: ENGINEERING CAMPUS
BOEING TRACT 1, ST. LOUIS, MISSOURI

Monitoring Well	Diameter (inches)	Screened Interval (ft bgs)	Total Depth (ft)	Installation Date	Status
MW2	2	8.0-18.0	19.1	7/17/2000	Active

Notes:
ft bgs: Feet below ground surface
ft: Feet

TABLE 8-3
SOIL DATA FOR AREA 7: ENGINEERING CAMPUS
BOEING TRACT 1, ST. LOUIS, MISSOURI

Group	BoeingParmName	MW-2-7
Metals	Arsenic	1,900
Metals	Barium	71,500
Metals	Cadmium	B 170
Metals	Chromium	20,900
Metals	Lead	6,600
Metals	Mercury	B 9

Notes:
All concentrations in ug/kg (micrograms per kilogram)
B: Detected in laboratory blank also

TABLE 8-4
COMPARISON OF AVERAGE AND MAXIMUM SOIL CONCENTRATIONS IN AREA 7: ENGINEERING CAMPUS TO BACKGROUND LEVELS
BOEING TRACT 1, ST. LOUIS, MISSOURI

COCs	# of Samples	# of Detects	Concentration			Comparison to Background Level	
			Average (ug/kg)	Maximum (ug/kg)	Background (ug/kg)	Average	Maximum
Metals							
Arsenic	1	1	1,900	1,900	9,200	Not Exceed	Not Exceed
Barium	1	1	71,500	71,500	725,000	Not Exceed	Not Exceed
Cadmium	1	1	170	170	< 1,000	Not Exceed	Not Exceed
Chromium	1	1	20,900	20,900	58,000	Not Exceed	Not Exceed
Lead	1	1	6,600	6,600	21,800	Not Exceed	Not Exceed
Mercury	1	1	9	9	39	Not Exceed	Not Exceed

TABLE 8-5
HISTORICAL GROUNDWATER ANALYTICAL DATA FOR AREA 7: ENGINEERING CAMPUS
BOEING TRACT 1, ST. LOUIS, MISSOURI

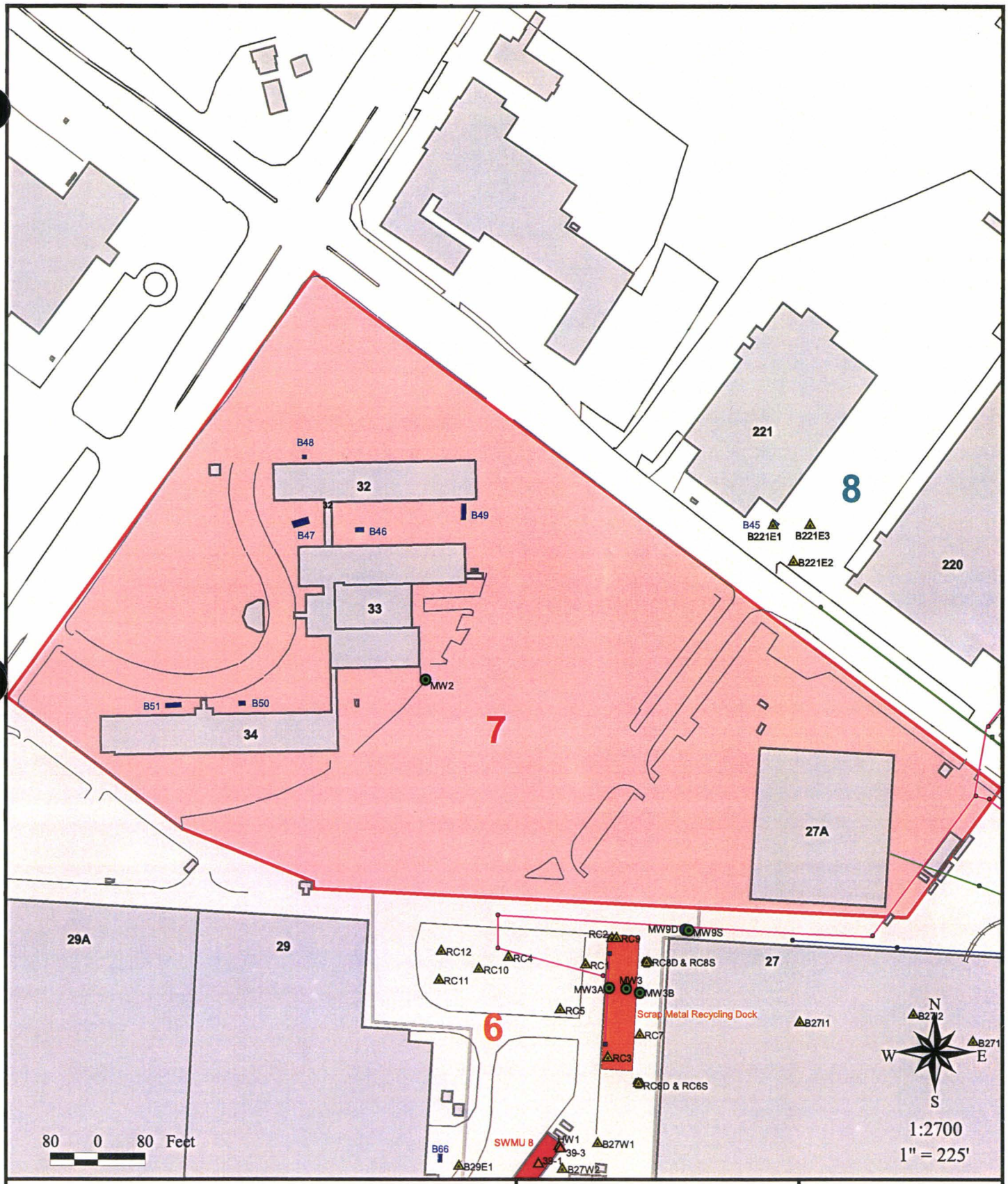
SAMP_ID	COLL_DATE	GROUP	Arsenic	Arsenic, Dissolved	Barium	Barium, Dissolved	Benzene	Chromium	Chromium, Dissolved	cis-1,2-Dichloroethene	Lead	Mercury	Selenium	Toluene
MW2W	27-Jul-00	Cyanide												
MW2W	27-Jul-00	Metals	16.8		664			140			27.5	B 0.083	5	
MW2W	27-Jul-00	PAHs												
MW2W	27-Jul-00	PCB												
MW2W	27-Jul-00	TPH												
MW2W	27-Jul-00	VOCs					< 1							< 1
MW2W	09-Jan-01	Metals	< 50		320			29			< 50	< 0.2	< 100	
MW2W	09-Jan-01	VOCs					< 5			< 5				< 5
MW2W	08-May-01	Metals	15		380			29			7	< 0.2		
MW2W	08-May-01	Metals, Dissolved		9.9		220			4.4					
MW2W	08-May-01	VOCs					< 1			1.4				1
MW2W	18-Jul-01	Metals	< 5		300			< 2			< 5	< 0.2		
MW2W	18-Jul-01	Metals, Dissolved		5		270			< 2					
MW2W	18-Jul-01	VOCs					< 1			2				< 5
MW2W	29-Oct-01	Metals	5.7		J4 420			J4 9			< 5	< 0.2		
MW2W	29-Oct-01	Metals, Dissolved		< 5		270			< 2					
MW2W	29-Oct-01	VOCs					< 1			1.5				< 5
MW2W	11-Mar-02	VOCs					< 1			1.5				< 5
MW2W	31-May-02	VOCs					< 1			H 1.1				< 5
MW2W	20-Jun-03	VOCs					3.5			1.4				< 5

Notes:
All concentrations in ug/L (micrograms per liter)
< Less than detection limit shown
Blank: Not analyzed
VOC: Volatile Organic Compound
TPH: Total petroleum hydrocarbon
PAH: Polynuclear aromatic hydrocarbon
PCB: Polychlorinated biphenol
Lab qualifiers in Section 1.0

TABLE 8-6
COMPARISON OF AVERAGE AND MAXIMUM GROUNDWATER CONCENTRATIONS IN AREA 7: ENGINEERING CAMPUS TO MAXIMUM CONTAMINANT LEVEL (MCL) OR EQUIVALENT
BOEING TRACT 1, ST. LOUIS, MISSOURI

COCs	# of Samples	# of Detects	Concentration			Comparison to MCL or Equivalent	
			Average (ug/L)	Maximum (ug/L)	MCL or Equivalent (ug/L)	Average	Maximum
Organics							
Benzene	8	1	1.1	3.5	5	Not Exceed	Not Exceed
cis-1,2-Dichloroethene	7	6	1.6	2.5	70	Not Exceed	Not Exceed
Toluene	8	1	2.1	2.5	1,000	Not Exceed	Not Exceed
TPH							
TPH as Diesel - DRO	1	0	250	250	NA	NA	NA
Volatile Petroleum Hydrocarbons - GRO	1	0	50	50	NA	NA	NA
Metals							
Arsenic	5	3	8.5	25	10	Not Exceed	Exceed
Barium	5	4	375	664	2,000	Not Exceed	Not Exceed
Chromium	5	3	40.7	140	100	Not Exceed	Exceed
Lead	5	2	8.4	27.5	15	Not Exceed	Exceed
Mercury	5	1	0.1	0.1	2	Not Exceed	Not Exceed
Selenium	2	1	27.5	50.0	50	Not Exceed	Not Exceed

Notes:
ug/L: micrograms per liter
NA: Not available
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic



Legend

- Other Shallow Boring
- RFI Shallow Boring
- RFI Shallow Boring/Temp. Piezometer
- RFA Boring
- Abandoned Shallow Piezometer
- Abandoned Shallow Well
- RFI Deep Boring/Temp. Piezometer
- Industrial Sewer Line
- Storm Sewer Line
- Manhole (Type by Color)
- Storm Sewer Intake
- Storm Sewer Outlet
- UST
- SWMU

Drawn by: KLC Approved by:

Checked by: Date: December 5, 2003

Risk Assessment & Management Group, Inc.

Figure 8-1
Exposure Area 7:
Engineering Campus,
Boeing Tract 1 North

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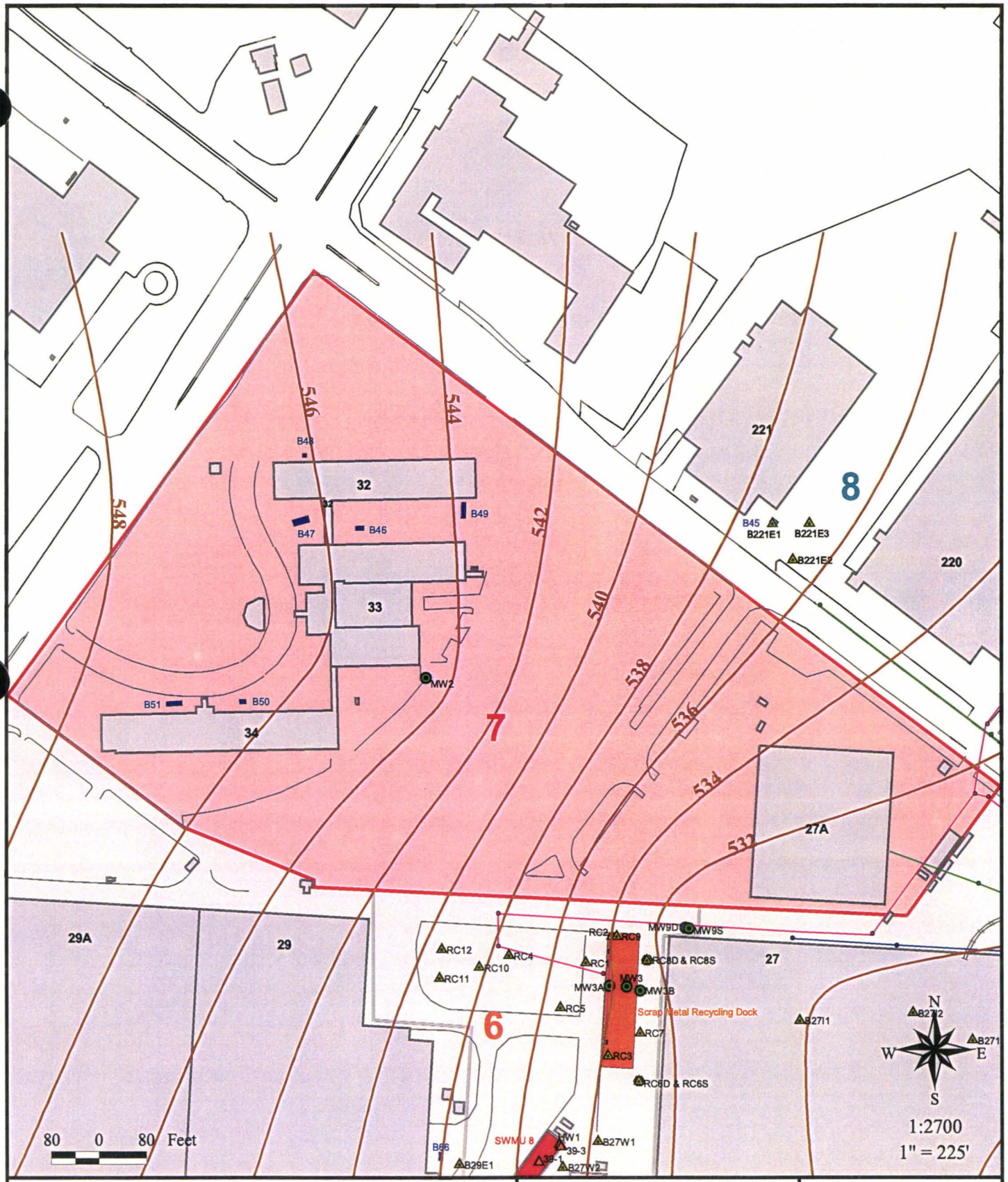

Legend

- Other Shallow Boring
- RFI Shallow Boring
- RFI Shallow Boring/Temp. Piezometer
- RFA Boring
- Abandoned Shallow Piezometer
- Abandoned Shallow Well
- RFI Deep Boring/Temp. Piezometer
- Shallow Groundwater Isopleth
- Industrial Sewer Line
- Storm Sewer Line
- Manhole (Type by Color)
- Storm Sewer Intake
- Storm Sewer Outlet
- UST
- SWMU

Drawn by: KLC Approved by:

Checked by: Date: December 5, 2003

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Figure 8-2
Shallow Groundwater Isopleth Map For Area 7: Engineering Campus, Boeing Tract 1 North

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ATTACHMENT 8-A

ECOLOGICAL RISK ASSESSMENT
TIER 1 SCREENING CHECKLIST FOR POTENTIAL RECEPTORS AND HABITAT
CHECKLIST #1

1. Is the site less than ½ mile to a surface water resource (pond, river, lake, etc.)?

   No, Coldwater Creek is located at least 3,000 feet from the area.

2. Are wetlands (e.g. marshes, swamps, fens) on or adjacent to the site?

   No.

3. Are contaminated soils uncovered or otherwise accessible to ecological receptors and the elements?

   No, the area is mostly paved.

4. Has a process (operational) discharge or storm water permit not been issued for the site?

   Yes, Facility-wide there is a storm water permit.

5. Is the site located in a known Karst environment (see Reference map)?

   No.

6. Are there federal or state rare, threatened, or endangered species on or within a ½ mile radius of the site? Note, the ½ mile radius limit does not necessarily apply to situations where a hydrogeological connection exists between the site and karsitic features.

   No.

7. Are there one or more environmentally sensitive areas (see Ecological Risk Assessment Figure #1 for definition) at or within a ½ mile radius of the site?

   No.

8. Are commercially or recreationally important species (fauna or flora) on or within a ½ mile radius of the site?

   No.

ATTACHMENT 8-B

ECOLOGICAL RISK ASSESSMENT
TIER 1 SCREENING CHECKLIST FOR POTENTIAL RECEPTORS AND HABITAT
CHECKLIST #2

1a. Can contaminants associated with the site leach, dissolve, or otherwise migrate to groundwater?

No, no evidence of impact was observed.

1b. Are contaminants associated with the site mobile in groundwater?

No, no evidence of impact was observed.

1c. Does groundwater from the site discharge into to ecological receptor habitat?

Eventually, groundwater discharges into Coldwater Creek.

1. Could contaminants associated with the site reach ecological receptors via groundwater?

No, no evidence of impact was observed.

2a. Is NAPL present at the site?

No.

2b. Is NAPL migrating?

No.

2c. Could NAPL discharge occur where ecological receptors are found?

No.

2. Could contaminants from the site reach ecological receptors via migration of NAPL?

No.

3a. Are contaminants present in surface soils?

No, no evidence of impact was observed.

3b. Can contaminants be leached from or be transported by erosion of surface soils?

No, no evidence of impact was observed.

3. Could contaminants reach ecological receptors via erosional transport of contaminated soil or via precipitation runoff?

No, no evidence of impact was observed.

4a. Are contaminants present in surface soil or on the surface of the ground?

No, no evidence of impact was observed.

4b. Are potential ecological receptors on the site?

No, the site is mostly paved.

4. Could contaminants reach ecological receptors via direct contact?

No, no evidence of impact was observed.

5a. Are contaminants present on the site volatile?

No, no evidence of impact was observed.

5b. Could contaminants on the site be transported in air as dust or particulate matter?

No, no evidence of impact was observed.

5. Could contaminants reach ecological receptors via inhalation of volatilized contaminants or contaminants adhered to dust in ambient air or in subsurface burrows?

No, no evidence of impact was observed.

6a. Are contaminants present in surface and shallow subsurface soils or on the surface of the ground?

No, no evidence of impact was observed.

6b. Are contaminants found in soil on the site taken up by plants growing on the site?

No, no evidence of impact was observed.

6c. Do potential ecological receptors on or near the site feed on plants found on the site?

No, no evidence of impact was observed.

6d. Do contaminants found on the site bioaccumulate?

No, no evidence of impact was observed.

6. Could contaminants reach ecological receptors via ingestion of either soil, plants, animals, or contaminants directly?

No, no evidence of impact was observed.

7a. Are there Karsitic features on or within a ½ mile radius of the site?

No.

7b. Is there a hydrogeological connection between the site and karsitic features such as seeps, springs, streams, or other surface water bodies?

No.

7. Could contaminants reach ecological receptors via transport through a Karst system?

No.

Section
9.0

9.1 INTRODUCTION

The Office Complex North (Area 8) is located to the north of James S. McDonnell Boulevard (see Figure 9-1). This section describes the constituents found in this Area, the exposure model, the evaluation of the current and future risk to human health and the environment, and conclusions based on the results of the risk evaluation.

9.2 DESCRIPTION OF AREA

The Office Complex North is an area approximately 800 feet wide by 1,000 feet long. Within this Area are two buildings (220 and 221) separated by a small parking lot. The Area is currently paved, and will likely remain paved in the future. For the purposes of this risk evaluation, Area 8 was further subdivided into three Sub-areas; 8A, 8B, and 8C (see Figure 9-1), to (i) reduce the size of the exposure units evaluated, and (ii) to evaluate the risk from specific sources. A brief description of the Sub-areas follows:

- Sub-area 8A: This Sub-area covers about 4.4 acres and consists of the southern portion of Building 220 and associated parking and access areas along the south and east perimeter of the building. The primary chemicals that exceeded screening criteria in this Sub-area were VOCs and metals.

- Sub-area 8B: This Sub-area covers about 6 acres and consists of the northern portion of Building 220 and open areas to the west and north of the building including parking, access, and operational areas and vegetated areas along the western and northern perimeter of the property. The primary chemicals that exceeded screening criteria in this Sub-area were VOCs, TPH, PAHs, and metals.

- Sub-area 8C: This Sub-area covers about 5.8 acres and consists of Building 221 and the associated parking and access areas to the west, north, and east of the building. The primary chemicals that exceeded screening criteria in this Sub-area were VOCs and TPH.

9.2.1 Potential Sources within Area

Potential former sources (see Figure 9-1) in this Area include:

Sub-area 8A

- Trichloroethene vapor degreaser (within Building 220). The trichloroethene degreaser was situated within Building 220, aboveground in a concrete containment area, and was removed in 1998. Soil samples were collected and analyzed during the removal activities and no hydrocarbon constituents were detected.

Sub-area 8B

- Trash compactor with a hydraulic oil system (north end of Building 220). Visual observations indicated that the trash compactor had leaked hydraulic oil onto the adjacent asphalt.

Sub-area 8C

- Fuel oil UST (located near the southeast corner of Building 221) (see Table 9-1 for UST details). The fuel oil UST was removed in 1990 by excavation, and three confirmatory soil samples collected (see Table 9-2 for analytical data). Due to the age of this data, it was not used in the risk assessment.

No SWMUs were located within this Area. Hence, we anticipate impact within this Area to be primarily petroleum hydrocarbons and chlorinated solvents.

9.2.2 Soil Stratigraphy within Area

Based on the soil boring logs for this Area, the stratigraphy consists primarily of silty clay with some clayey silt, silt, and clay from 0.5 foot bgs to a depth of 78 feet bgs, where a basal gravel layer is present on top of the limestone bedrock that was encountered at 79.5 feet bgs. This is consistent with the Facility-wide soil stratigraphy. No karst features have been identified within this Area. For the calculation of risk to indoor inhalation, a soil source average depth for each of the Sub-areas was used as noted below (see Table 1-9):

- Sub-area 8A: 2.5 feet (76 cm)
- Sub-area 8B: 6.3 feet (192 cm)*
- Sub-area 8C: 4.4 feet (134 cm)*

*Indicates that the depth to soil source was below the average depth for the groundwater table; therefore, we used the average depth to groundwater in the risk calculations.

9.2.3 Hydrogeology within Area

There are two shallow monitoring wells within this Area and one deep monitoring well (see Table 9-3 for further details). Consistent with the Facility-wide shallow groundwater flow direction, groundwater flows towards Coldwater Creek to the east (Figure 9-2). Depth to shallow groundwater is based on water level measurements in monitoring wells MW4 and MW10S. To evaluate risk to indoor inhalation, an average depth to groundwater for each of the Sub-areas was used as noted below (see Table 1-13):

- Sub-area 8A: 4.4 feet (134 cm)
- Sub-area 8B: 6.3 feet (192 cm)
- Sub-area 8C: 4.4 feet (134 cm)

9.3 LAND USE

9.3.1 Current Land Use

Currently, the Area is non-residential, with office space occupied by Boeing. Offsite, in the downgradient direction (to the east) the area is also non-residential, with a mixture of warehouses and office space.

9.3.2 Future Land Use

The office complex is anticipated to remain as non-residential office space in the future. Offsite, the land use is expected to remain the same, as a result of the density of non-residential development in the vicinity. This area is an established non-residential area, and it is unlikely, based on the proximity of the area to a major airport, that this will change in the future.

9.4 AVAILABLE DATA

The following gives an overview of the available data within the Area:

- Three monitoring wells are located within this Area (MW10S and MW10D in Sub-area 8A, and MW4 in Sub-area 8B), and have been sampled up to 11 times since July 2000;
- The wells have been sampled for groundwater at least eight times between July 2000 and June 2003;
- A total of 17 soil borings (including the three monitoring well borings) have been advanced in this Area (ten in Sub-area 8A, four in Sub-area 8B, and three in Sub-area 8C) resulting in the collection of twenty-six soil samples;
- Groundwater samples were collected once from eight piezometers in 2000;
- Three confirmatory soil samples were collected during UST removal activities in 1990; however, due to the age of this data it was not used in the risk assessment; and
- Forty-one groundwater samples including three duplicates have been obtained from July 2000 to June 2003.

9.5 CONSTITUENTS IDENTIFIED WITHIN AREA

9.5.1 Soil

The 26 soil samples were analyzed during the various investigations conducted within the Area for comprehensive list of constituents that included VOCs, PAHs, PCBs, TPH, metals, and cyanide. Typical laboratory methods that were used include SW 846 Methods 6010, 7470, 7471, 8015, 8021, 8082, 8260, 8310, and 9012. Appendix I-1 includes a comprehensive table of the laboratory data for constituents that were detected at least once in soil samples from Area 8. Evaluation of the data in Appendix I-1 indicated that the following 16 constituents were detected in at least one soil sample:

METALS		ORGANICS/TPH	
Arsenic	Chromium	1,2-Dichloroethene (total)	Tetrachloroethene
Barium	Lead	Acetone	Trichloroethene
Cadmium	Mercury	cis-1,2- Dichloroethene	Benzo(b)fluoranthene
		Methylene chloride	Chrysene
		Methyl ethyl ketone (MEK)	TPH (2 types)

The data was further screened for potential exposures to the non-residential worker and construction worker for each Sub-area.

Note as discussed in Sections 1.9.11 and 1.9.12, respectively, lead and 1-2 dichloroethene (total) were eliminated.

9.5.1.1 Sub-area 8A

Non-residential Worker

The non-residential worker data are constituents in soil samples collected above the groundwater table. Soil samples collected at or above a depth of 4.4 feet bgs were included (see Table 1-13).

Metals whose maximum concentrations did not exceed the background levels were eliminated from further consideration and include barium, cadmium, chromium, and lead.

Based on this evaluation, the following three constituents were considered for quantitative risk evaluation for soil exposures to the non-residential worker:

METALS		VOCs
Arsenic	Mercury	Trichloroethene

Construction Worker

The construction worker data are constituents in soil samples collected above the typical construction depth. To be conservative, soil samples collected at or above a depth of 20 feet bgs are included.

Metals whose maximum concentrations did not exceed the background levels were eliminated from further consideration and include barium, cadmium, chromium, and lead.

Based on this evaluation, the following seven constituents were considered for quantitative risk evaluation for soil exposures to the construction worker:

METALS	VOCs
Arsenic	Acetone
Mercury	cis-1,2-dichloroethene
	Methylene chloride
	Methyl ethyl ketone
	Trichloroethene

9.5.1.2 Sub-area 8B

Non-residential Worker

The non-residential worker data are constituents in soil samples collected above the groundwater table. Soil samples collected at or above a depth of 6.3 feet bgs are included (see Table 1-13).

Metals whose maximum concentrations did not exceed the background levels were eliminated from further consideration and include arsenic, barium, cadmium, chromium, and lead.

Based on this evaluation, no constituents were considered for quantitative risk evaluation for non-residential worker soil exposures in Sub-area 8B.

Construction Worker

The construction worker data are constituents in soil samples collected above the typical construction depth. To be conservative, soil samples collected at or above a depth of 20 feet bgs are included.

Metals whose maximum concentrations did not exceed the background levels were eliminated from further consideration and include arsenic, barium, cadmium, chromium, lead, and mercury.

Based on this evaluation, no constituents were considered for quantitative risk evaluation for construction worker soil exposures in Sub-area 8B.

9.5.1.3 Sub-area 8C

Non-residential Worker

The non-residential worker data are constituents in soil samples collected above the groundwater table. No constituents were detected in soil samples collected at or above the average groundwater depth of 4.4 feet bgs (see Table 1-13).

Construction Worker

The construction worker data are constituents in soil samples collected above the typical construction depth. To be conservative, soil samples collected at or above a depth of 20 feet bgs are included.

The following three constituents were considered for quantitative risk evaluation for soil exposures to the construction worker:

VOCs/TPH	
Acetone	TPH (15 types)
Tetrachloroethene	

9.5.2 Groundwater

Groundwater samples were analyzed during the various investigations for a comprehensive list of constituents that included VOCs, PAHs, PCBs, TPH, metals, and cyanide. Typical laboratory methods used include SW 846 Methods 6010, 7470, 8015, 8082, 8260, 8310, 9012, TX 1005, and TX 1006. Within this Area, there are eight soil borings where individual groundwater samples have been collected in addition to three groundwater monitoring wells (MW10S, MW10D, and MW4). Appendix I-2 includes a comprehensive list of the groundwater analytical data for constituents that were detected at least once in groundwater samples from Area 8.

Of the various constituents analyzed in groundwater, the following 15 constituents were detected in at least one groundwater sample:

METALS	ORGANICS/TPH	
Arsenic	1,1-Dichloroethane	Methylene chloride
Barium	1,1-Dichloroethene	Toluene
Chromium	1,2-Dichloroethene (total)	Trichloroethene
Lead	Bromomethane	Vinyl chloride
Mercury	cis-1,2-Dichloroethene	TPH (2 types)
Manganese		

Methylene chloride was not carried forward since it was the only VOC detect in those specific samples.

The data were segregated for each Sub-area and further screened for potential exposures to the non-residential worker and construction worker.

9.5.2.1 Sub-area 8A

Evaluation of the data in Tables 9A-8(a) and 9A-8(b) indicated the following 12 constituents were detected in at least one groundwater sample from Sub-area 8A.

METALS	VOCs
Arsenic	1,1-Dichloroethane
Barium	1,1 Dichloroethene
Chromium	1,2-Dichloroethene (total)
Lead	cis-1,2-Dichloroethene
Manganese	Toluene
	Trichloroethene
	Vinyl chloride

Constituents for which the screening criteria exceeded the maximum detected concentration were eliminated from further consideration and included, 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, and toluene.

Note as discussed in Sections 1.9.11 and 1.9.12, respectively, lead and 1,2-dichloroethene (total) were eliminated.

The remaining constituents consist of 2 VOCs and 4 metals. These constituents are listed in the following table:

TOTAL METALS	VOCs/TPH	
Arsenic	Trichloroethene	Vinyl chloride
Barium		
Chromium		
Manganese		

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for ground water exposures in Sub-area 8A.

9.5.2.2 Sub-area 8B

Evaluation of the data in Tables 9B-8(a), 9B-8(b) and 9B-8(c) indicated the following seven constituents were detected at least once in groundwater samples from Sub-area 8B.

METALS	VOCs/TPH
Arsenic	Bromomethane
Barium	TPH
Chromium	
Lead	
Mercury	

Constituents for which the target level criteria exceeded the maximum concentration were eliminated from further consideration and included bromomethane, barium, and mercury. Note as discussed in Section 1.9.11, lead was also eliminated.

The remaining constituents consist of 2 metals and TPH. These constituents are listed in the following table:

METALS	TPH
Arsenic	TPH (16 types)
Chromium	

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for ground water exposures in Sub-area 8B.

9.5.2.3 Sub-area 8C

Evaluation of the data in Tables 9C-8(a) and 9C-8(b) indicated the following one constituent was detected at least once in groundwater samples from Sub-area 8C. This constituent is listed in the following table:

TPH
TPH

Based on this evaluation, the constituent listed above was considered for quantitative risk evaluation for ground water exposures in Sub-area 8C.

9.6 FREE PRODUCT

Free product has not been observed within this Area.

9.7 EXPOSURE MODEL

9.7.1 Current Conditions for Sub-areas 8A, 8B, and 8C

Under current conditions, this Area is comprised of office buildings and parking lots. Hence, the current receptor would be the non-residential worker in the office building, and a visitor/maintenance worker to the Area. As the exposure duration for the visitor/maintenance worker is small relative to the on-site non-residential worker, the risk from any soil or groundwater impact will not be quantitatively evaluated for the visitor/maintenance worker.

Exhibit 9-1 presents the EM for the current non-residential worker.

EXHIBIT 9-1. EM CURRENT ON-SITE NON-RESIDENTIAL WORKER (SUB-AREAS 8A, 8B, AND 8C)

Scenario, Receptor, and Pathways / Routes Analyzed	C or NC	Justification
Dermal Contact with Surficial Soil	NC	The Area is entirely paved; therefore, contact with surficial soil is unlikely.
Ingestion of Surficial Soil	NC	The Area is entirely paved; therefore, ingestion of surficial soil is unlikely.
Indoor Inhalation of Vapors from Subsurface Soil	**C**	**A number of volatile constituents were identified in soil within this Area in the vicinity of the buildings, hence this pathway is complete.**
Indoor Inhalation of Vapors from Groundwater	**C**	**A number of volatile constituents were identified in groundwater within this Area in the vicinity of the buildings, hence this pathway is complete.**

Notes: NC: Not Complete C: Complete

Exposure pathways highlighted in bold indicate that these pathways are complete and will be quantitatively evaluated.

9.7.2 Future Conditions for Sub-areas 8A, 8B, and 8C

Under future conditions, the land use in this Area is not expected to change, hence the receptors will remain the same in the future. As such, they will not be quantitatively evaluated as the comparison for the current conditions will be protective of the future non-residential worker. Groundwater concentrations are expected to decrease in the future through natural attenuation processes, further reducing the risk.

A construction worker could be present at the site in the future. Exhibit 9-2 presents the EM for the construction worker.

The downgradient receptor is also a non-resident; therefore, the evaluation for the on-site worker will be protective of the offsite receptor, as concentrations in groundwater are expected to decrease further from the source area. No soil impact from Boeing operations is expected offsite.

EXHIBIT 9-2. EM POTENTIAL FUTURE CONSTRUCTION WORKER (SUB-AREAS 8A, 8B, AND 8C)

Scenario, Receptor, and Pathways / Routes Analyzed	C or NC	Justification
Dermal Contact with Soil	C	**Soil is impacted within the normal depth of construction; therefore, contact is possible.**
Ingestion of Soil	C	**Soil is impacted within the normal depth of construction; therefore, ingestion is possible.**
Outdoor Inhalation of Vapors from Soil	C	**Soil is impacted within the normal depth to construction with volatile constituents; therefore, inhalation is possible.**
Dermal Contact with Groundwater	C	**Groundwater is impacted within the normal depth of construction; therefore, contact is possible.**
Outdoor Inhalation of Vapors from Groundwater	C	**Groundwater within this Area is impacted by volatile constituents, hence this pathway is possible.**

Notes: NC: Not Complete C: Complete

Exposure pathways highlighted in bold indicate that these pathways are complete and will be quantitatively evaluated.

9.8 REPRESENTATIVE CONCENTRATION

Representative concentrations for this Area were determined to be the Area-wide average in soil and groundwater. This was chosen as the sampling activities that have been performed have all been within the areas of most impact; therefore, the mean concentration represents a conservative estimate of the overall impact to the Area. Additionally, no information is known regarding the likely future location of a building; therefore, it is prudent to identify the source areas as the representative concentration.

Note representative concentrations in groundwater were estimated by first averaging the concentration in each well and then averaging the concentrations for the various wells located within the Sub-area.

Tables 9A-11(a), 9A-11(b), 9B-11(a), 9B-11(b), 9C-11(a), 9C-11(b), 9A-12, 9B-12, and 9C-12 present the soil and groundwater average and maximum concentrations. The ratio of the maximum detected concentration to average concentration is also presented. None of the constituents exceeded a ratio of 10.

9.9 CALCULATION OF RISK

Tables 9A-11(a), 9B-11(a), and 9C-11(a) present the results for the non-residential worker for Sub-area 8A, Sub-area 8B, and Sub-area 8C, respectively. Tables 9A-11(b), 9B-11(b), and 9C-11(b) present the results for the construction worker for Sub-area 8A, Sub-area 8B, and Sub-area 8C, respectively. The tables present the carcinogenic (IELCR) and non-carcinogenic (HQ and HI) risks for:

- Each COC,
- Each route of exposure,
- Cumulative risk for each COC,
- Cumulative risk for each route of exposure, and
- Total risk which is the sum of risk for all the COCs and all the routes of exposures.

Based on these tables, following are the key observations.

9.9.1 Sub-area 8A

9.9.1.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 9A-11(a), the cumulative IELCR is 2.37×10^{-8}, which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 9A-11(a), the cumulative HI is 0.00031, which is well below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1.0, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

9.9.1.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 9A-11(b), the cumulative IELCR is 1.02×10^{-7}, which is below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 9A-11(b), the cumulative HI is 0.020, which is below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1.0, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

9.9.2 Sub-area 8B

9.9.2.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 9B-11(a), the cumulative IELCR for non-residential worker in Sub-area 8B is not available.

Non-carcinogenic Risk:

As shown in Table 9B-11(a) the cumulative HI for all COCs and all routes of exposure is 54.6, which exceeds the regulatory acceptable level of 1.0. Further examination of the table indicates that the primary contributors to HI are HQs for indoor inhalation of aliphatics C12 – C16, aliphatics C16 – C21, and aliphatics C21 – C35 from groundwater. The contribution to the HI from all the other COCs and routes of exposure is significantly less than 1.0.

9.9.2.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 9B-11(b), the cumulative IELCR is 3.74×10^{-8}, which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 9B-11(b), the cumulative HI is 0.49, which is below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1.0, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

9.9.3 Sub-area 8C

9.9.3.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 9C-11(a), the cumulative IELCR for non-residential worker in Sub-area 8C is not available.

Non-carcinogenic Risk:

As shown in Table 9C-11(a), the cumulative HI is 0.064, which is well below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1, the HQ for each COC and each

route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

9.9.3.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 9C-11(b), the cumulative IELCR is 1.25×10^{-12}, which is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 9C-11(b), the cumulative HI is 0.0052, which is well below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

9.10 ECOLOGICAL RISK

The only potential ecological receptors in the area are Coldwater Creek, which flows north about 1,600 feet to the southeast of Area 8, and a tributary to Coldwater Creek, which flows southeast about 500 feet northeast of Area 8. There are no known unpermitted conduits present that could carry impacts from Area 8 to Coldwater Creek. Considering the geology, groundwater flow characteristics, and the chemical types and concentrations of impacts in Area 8, it is not likely that migration of impacts from Area 8 to Coldwater Creek or to its tributary will occur. The Tier 1 ecological screening checklists have been completed for this Area, and are presented as Attachment 9-A and Attachment 9-B. These checklists identified no potential ecological receptors or issues.

9.11 CONCLUSIONS

Sub-area 8A

The calculated risks for all the COCs and all potentially complete routes of exposure for the construction worker and the non-residential worker are below the acceptable target risks.

Sub-area 8B

The cumulative non-carcinogenic risk for the non-residential worker exceeded the target risk. The primary contributor to the risk was indoor inhalation of aliphatics C12 – C16, aliphatics C16 – C21, and aliphatics C21 – C35 from groundwater.

The calculated risks for all the COCs and all potentially complete routes of exposure for the construction worker are below the acceptable target risks.

Sub-area 8C

The calculated risks for all the COCs and all potentially complete routes of exposure for the construction worker and the non-residential worker are below the acceptable target risks.

Table 9-1
Summary of Underground Storage Tanks (USTs) Present Historically within Area 8: Office Complex North
Boeing Tract 1, St. Louis, Missouri

UST Number	Location	Volume (Gallons)	Contents	Construction Materials	Year Installed	Status	Comments
B-45	Near SEC of Bldg. 221	5,000	Fuel Oil	Single Wall Steel	1954	Removed 1990	Excavated

Table 9-2
Soil Data Collected During UST Removal Activities
Area 8: Office Complex North
Boeing Tract 1, St. Louis, Missouri

Sample ID	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)	TPH (mg/kg)
8173 south	<0.005	<0.005	<0.005	<0.015	13
8174 middle	<0.005	<0.005	<0.005	<0.015	<10
8175 north	<0.005	0.008	0.005	<0.015	84

Notes:
<: Less than detection limit shown
TPH: Total petroleum hydrocarbon
mg/kg: miligrams per kilogram

Table 9-3
Monitoring Well Information for Area 8: Office Complex North
Boeing Tract 1, St. Louis, Missouri

Sub-area	Monitoring Well	Diameter (inches)	Screened Interval (ft bgs)	Total Depth (feet)	Installation Date	Status
8A	MW10D	2	69.5-79.5	79.5	9/22/2000	Active
8A	MW10S	2	8.0-18.0	79.5	9/19/2000	Active
8B	MW4	2	9.5-19.5	19.5	7/18/2000	Active

Notes:
ft bgs: Feet below ground surface

Table 9-4
Soil Boring Information for Area 8: Office Complex North
Boeing Tract 1, St. Louis, Missouri

Sub-area	Boring	Date Drilled
8A	SB1	1/23/1999
8A	SB2	1/23/1999
8A	SB3	1/23/1999
8A	SB4	1/23/1999
8A	SB5	1/23/1999
8A	SB6	1/23/1999
8A	B220I1	7/24/2000
8A	B220I3	11/14/2000
8A	MW10S	9/19/2000
8B	B220N1	7/24/2000
8B	B220N2	9/19/2000
8B	B220N3	9/19/2000
8B	MW-4	7/18/2000
8C	B221E1	7/24/2000
8C	B221E2	7/26/2000
8C	B221E3	7/26/2000

Table 9-5
Soil Samples Used in Average Concentration Calculations in Area 8: Office Complex North
Boeing Tract 1, St. Louis, Missouri

	Volatile Organic Compounds		Total Petroleum Hydrocarbons		Polynuclear Aromatic Hydrocarbons		Polychlorinated Biphenyls		Metals	
	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker
8A	SB4 0-2	SB4 0-2							SB1 0-2	SB1 0-2
	SB5 0-2	SB5 0-2							SB2 0-2	SB2 0-2
	SB6 0-2	SB6 0-2							SB3 0-2	SB3 0-2
		B220I1-7							SB4 0-2	SB4 0-2
		MW10S-18							SB5 0-2	SB5 0-2
									SB6 0-2	SB6 0-2
										MW10S-18
8B		MW-4-16				MW-4-16			B220N3-6	B220N2-8
										B220N3-6
										MW-4-16
8C		B221E1-12		B221E1-12						
		B221E1-7		B221E1-7						
				B221E3-7						
				B221E2-8						

Note:
- analysis type not performed

Table 9A-6(a)
Soil Constituents Average Concentrations for VOCs in Sub-area 8A:
Office Complex North
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)					
	1,2-DICHLOROETHENE (TOTAL)	ACETONE	CIS-1,2-DICHLOROETHENE	METHYL ETHYL KETONE (MEK)	METHYLENE CHLORIDE	TRICHLOROETHENE
Non- Residential Worker						
SB4 0-2*	NA	NA	NA	NA	NA	55
SB5 0-2*	NA	NA	NA	NA	NA	54.3
SB6 0-2*	NA	NA	NA	NA	NA	10.6
Average Concentration - Only Samples With VOC Detections						39.97
Construction Worker						
SB4 0-2*	NA	NA	NA	NA	NA	55
SB5 0-2*	NA	NA	NA	NA	NA	54.3
SB6 0-2*	NA	NA	NA	NA	NA	10.6
B220I1-7	75	12.5	NA	12.5	11	48
MW10S-18	NA	130	1.75	110	3.5	3.5
Average Concentration - Only Samples With VOC Detections		71.25	38.38	61.25	7.25	34.28

Notes:
ug/kg - micrograms per kilogram
* - Hand auger samples from below Building 220 floor slab
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
VOCs - Volatile Organic Compounds
NA - Not Analyzed

Table 9A-6(b)
Soil Constituents Average Concentrations for Metals in Sub-area 8A: Office Complex North
Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)					
	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	MERCURY
SB1 0-2*	13,600	193,000	400	17,900	14,400	50
SB2 0-2*	12,400	161,000	400	22,000	15,500	20
SB3 0-2*	11,300	140,000	400	22,100	12,000	40
SB4 0-2*	10,900	130,000	400	33,100	10,200	40
SB5 0-2*	13,200	174,000	400	18,200	13,100	40
SB6 0-2*	13,600	171,000	300	17,300	14,400	40
Average Concentration - Only Samples With Metals Detections	12,500	161,500	383.3	21,767	13,267	38

Notes:
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs

ug/kg - micrograms per kilogram
NA - Not Analyzed

Table 9A-6(b)
Soil Constituents Average Concentrations for Metals in Sub-area 8A: Office Complex North
Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)					
	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	MERCURY
SB1 0-2*	13,600	193,000	400	17,900	14,400	50
SB2 0-2*	12,400	161,000	400	22,000	15,500	20
SB3 0-2*	11,300	140,000	400	22,100	12,000	40
SB4 0-2*	10,900	130,000	400	33,100	10,200	40
SB5 0-2*	13,200	174,000	400	18,200	13,100	40
SB6 0-2*	13,600	171,000	300	17,300	14,400	40
MW10S-18	2,400	69,100	720	9,400	5,000	70
Average Concentration - Only Samples With Metals Detections	11,057	148,300	431.4	20,000	12,086	43

Notes:
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs

ug/kg - micrograms per kilogram
NA - Not Analyzed

Table 9B-6(a)
Soil Constituents Average Concentrations for VOC's in Sub-area 8B: Office Complex North Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)		
	ACETONE	METHYL ETHYL KETONE (MEK)	METHYLENE CHLORIDE
Non- Residential Worker			
B220N3-6	12.5	12.5	8.9
Average Concentration - Only Samples With VOC Detections			
Construction Worker			
B220N2-8	30	13	10
B220N3-6	12.5	12.5	8.9
MW-4-16	14.5	10	3.55
Average Concentration - Only Samples With VOC Detections		10	

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 6 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
VOCs - Volatile Organic Compounds
NA - Not Analyzed
No VOCs except acetone and/or methylene chloride detected in the sample

Table 9B-6(b)
Soil Constituents Average Concentrations for Metals in Sub-area 8B: Office Complex North
Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)					
	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	MERCURY
B220N3-6	4,100	118,000	770	14,900	9,300	65
Average Concentration - Only Samples With Metals Detections	4,100	118,000	770	14,900	9,300	

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 6 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 9B-6(b)
Soil Constituents Average Concentrations for Metals in Sub-area 8B: Office Complex North
Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)					
	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	MERCURY
B220N2-8	7,400	103,000	720	13,900	7,900	65
B220N3-6	4,100	118,000	770	14,900	9,300	65
MW-4-16	4,500	59,600	355	11,800	8,200	14
Average Concentration - Only Samples With Metals Detections	5,333	93,533	615	13,533	8,467	48

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 6 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 9B-6(c)
Soil Constituents Average
Concentrations for PAHs in Sub-area 8B:
Office Complex North
Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	PAH (ug/kg)	
	BENZO(B)FLUORANTHENE	CHRYSENE
MW-4-16	66	44
Average Concentration - Only Samples With PAH Detections	**66**	**44**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 6 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
PAH - Polynuclear aromatic hydrocarbon
NA - Not Analyzed

Table 9C-6(a)
Soil Constituents Average Concentrations for VOC's in Sub-area 8C: Office Complex North Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)	
	ACETONE	TETRACHLOROETHENE
Non- Residential Worker		
Average Concentration - Only Samples With VOC Detections		
Construction Worker		
B221E1-12	63	4.6
B221E1-7	71	2.1
B221E2-8	19	3.2
B221E3-7	27	3.15
Average Concentration - Only Samples With VOC Detections	67	3.35

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
VOCs - Volatile Organic Compounds
No VOCs except acetone detected in the sample

Table 9C-6(b)
Soil Constituents Average Concentrations for TPHs in Sub-area 8C: Office Complex North
Construction Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B221E1-12	B221E1-7	B221E2-8	B221E3-7	Overall Area Average (ug/kg)
TPH - DRO					TPH - DRO
7/24/2000	**330,000**	**1,200,000**	NA	NA	
7/26/2000	NA	NA	16,000	15,500	
AVERAGE TPH - DRO	330,000	1,200,000	16,000	15,500	390,375
TPH - GRO					TPH - GRO
7/24/2000	**5,200**	**2,900**	NA	NA	
7/26/2000	NA	NA	65	**220**	
AVERAGE TPH - GRO	5,200	2,900	65	220	2,096
TPH - ORO					TPH - ORO
None					
AVERAGE TPH - ORO					

Notes:
Groundwater table is at a depth of 4 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
ug/kg - micrograms per kilogram
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 9-7
Groundwater Samples Used in Average Concentrations Calculations in Area 8: Office Complex North
Boeing Tract 1, St. Louis, Missouri

	Volatile Organic Compounds	Total Petroleum Hydrocarbons	Polynuclear Aromatic Hydrocarbons	Polychlorinated Biphenyls	Metals
8A	B220I1W				MW10SW
	MW10SW				
8B	MW4W	B220N1W			B220N2W
					B220N3W
					MW4W
8C		B221E1W			

Note:
- analysis type not performed

Table 9A-8(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 8A:
Office Complex North
Boeing Tract 1, St. Louis, Missouri

GROUP	VOCs (ug/l)						
	1,1-DICHLOROETHANE	1,1-DICHLOROETHENE	1,2-DICHLOROETHENE (TOTAL)	CIS-1,2-DICHLOROETHENE	TOLUENE	TRICHLOROETHENE	VINYL CHLORIDE
B220I1W	0.5	0.88	54	NA	0.5	220	1
MW10SW	13.70	0.79	NA	2.99	2.42	0.79	2.82
Average Concentration - Only Samples With VOC Detections	**7.10**	**0.83**		**28.49**	**1.46**	**110.39**	**1.91**

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed

Table 9A-8(b)
Groundwater Constituents Average Concentrations for Metals in Sub-area 8A: Office Complex North
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/l)				
	ARSENIC	BARIUM	CHROMIUM	LEAD	MANGANESE
MW10SW	23	860	109.51	29.47	1300
Average Concentration - Only Samples With Metals Detections	**23**	**860**	**109.51**	**29.471**	**1300**

Notes:
ug/l - micrograms per liter
NA - Not Analyzed
Bold indicates a detection

Table 9B-8(a)
Groundwater Constituents Average Concentrations for VOCs in Sub-area 8B:
Office Complex North
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/l)
	BROMOMETHANE
MW4W	1.288
Average Concentration - Only Samples With VOC Detections	1.29

Notes:
ug/l - micrograms per liter
VOCs - Volatile Organic Compounds
NA - Not Analyzed

Table 9B-8(b)
Groundwater Constituents Average Concentrations
for TPHs in Sub-area 8B: Office Complex North
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B220N1W	B220N1W - 2004	Overall Area Average (ug/l)
TPH-DRO			TPH-DRO
7/25/2000	**35,000**	NA	
4/29/2004	NA	**64,000**	
AVERAGE	35,000	64,000	49,500
TPH-GRO			TPH-GRO
4/29/2004	NA	**250**	
AVERAGE		250	250
TPH-ORO			TPH-ORO
4/29/2004	NA	**32,000**	
AVERAGE		32,000	32,000

Notes:
ug/l - micrograms per liter
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 9B-8(c)
Groundwater Constituents Average Concentrations for Metals in
Sub-area 8B: Office Complex North
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/l)				
	ARSENIC	BARIUM	CHROMIUM	LEAD	MERCURY
B220N2W	**13.2**	**332**	**44.3**	**19.2**	**0.1**
B220N3W	**17.7**	**518**	**59.4**	**18.8**	**0.1**
MW4W	**13.48**	**426.6**	**50.62**	**18.76**	**0.102**
Average Concentration - Only Samples With Metals Detections	**14.793**	**425.53**	**51.44**	**18.92**	**0.1007**

Notes:
ug/l - micrograms per liter
NA - Not Analyzed
Bold indicates a detection

Table 9C-8(a)
Groundwater Constituents Average Concentrations for TPHs in Sub-area 8C: Office Complex North
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B221E1W	Overall Area Average (ug/l)
TPH-DRO		TPH-DRO
7/25/2000	250	
7/26/2000	NA	
AVERAGE	250	250
TPH-GRO		TPH-GRO
7/25/2000	**650**	
7/26/2000	NA	
AVERAGE	650	650
TPH-ORO		TPH-ORO
None		
AVERAGE		

Notes:
ug/l - micrograms per liter
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 9A-9(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Sub-area 8A: Office Complex North
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Trichloroethene	6	3	1.36	54.3	39.97	NA	N/A
Total Metals							
Arsenic	6	6	1.09	13,600	12,500	9,200	Y
Barium	6	6	1.20	193,000	161,500	725,000	N
Cadmium	6	6	1.04	400	383.3	<1,000	N
Chromium	6	6	1.52	33,100	21,767	58,000	N
Lead	6	6	1.17	15,500	13,267	21,800	N
Mercury	6	6	1.30	50	38	39	Y

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 9A-9(b)
Soil Constituents of Concern Summary for Construction Worker for Sub-area 8A: Office Complex North
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Acetone	3	1	1.82	130	71.25	NA	N/A
cis-1,2-Dichloroethene	4	1	1.95	75	38.38	NA	N/A
Methyl ethyl ketone (MEK)	3	1	1.80	110	61.25	NA	N/A
Methylene chloride	4	1	1.52	11	7.25	NA	N/A
Trichloroethene	10	1	1.58	54.3	34.28	NA	N/A
Polynuclear Aromatic Hydrocabons (PAHs)							
None		0	N/A	ND	N/A	N/A	N/A
Total Metals							
Arsenic	7	7	1.23	13,600	11,057	9,200	Y
Barium	7	7	1.30	193,000	148,300	725,000	N
Cadmium	7	7	1.67	720	431.4	<1,000	N
Chromium	7	7	1.66	33,100	20,000	58,000	N
Lead	7	7	1.28	15,500	12,086	21,800	N
Mercury	7	6	1.17	50	43	39	Y

Notes:

ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 9B-9(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Sub-area 8B: Office Complex North
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
None	1	0	N/A	ND	N/A	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	2	0	N/A	ND	N/A	NA	N/A
TPH GRO	2	0	N/A	ND	N/A	NA	N/A
Total Metals							
Arsenic	1	1	1.00	4,100	4,100	9,200	N
Barium	1	1	1.00	118,000	118,000	725,000	N
Cadmium	1	1	1.00	770	770.0	<1,000	N
Chromium	1	1	1.00	14,900	14,900	58,000	N
Lead	1	1	1.00	9,300	9,300	21,800	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 9B-9(b)
Soil Constituents of Concern Summary for Construction Worker for Sub-area 8B: Office Complex North
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Methyl ethyl ketone (MEK)	3	1	1.00	10	10.00	NA	N/A
Polynuclear Aromatic Hydrocabons (PAHs)							
Benzo(b)fluoranthene	1	1	1.00	66	66	N/A	N/A
Chrysene	1	1	1.00	44	44	N/A	N/A
Polychlorinated Biphenyls (PCBs)							
None		0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	4	0	N/A	ND	N/A	NA	N/A
TPH GRO	4	0	N/A	ND	N/A	NA	N/A
Total Metals							
Arsenic	3	3	1.39	7,400	5,333	9,200	N
Barium	3	3	1.26	118,000	93,533	725,000	N
Cadmium	3	2	1.25	770	615.0	<1,000	N
Chromium	3	3	1.10	14,900	13,533	58,000	N
Lead	3	3	1.10	9,300	8,467	21,800	N
Mercury	3	1	0.29	14	48	39	N

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 9C-9(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Sub-area 8C: Office Complex North
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
None							

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 9C-9(b)
Soil Constituents of Concern Summary for Construction Worker for Sub-area 8C: Office Complex North
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Acetone	4	4	1.06	71	67.00	NA	N/A
Tetrachloroethene	4	2	1.37	4.6	3.35	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	4	2	3.07	1,200,000	390,375	NA	N/A
TPH GRO	4	3	2.48	5,200	2,096	NA	N/A

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 9A-10
Groundwater Constituent of Concern Summary for Sub-area 8A: Office Complex North
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
1,1-Dichloroethane	14	12	2.54	18	7.10	157	N
1,1-Dichloroethene	13	1	1.06	0.88	0.83	7.0	N
cis-1,2-Dichloroethene	17	15	1.90	54	28.49	70	N
Toluene	13	1	0.96	1.4	1.46	1,000	N
Trichloroethene	13	2	1.99	220	110.39	5	Y
Vinyl chloride	15	11	1.88	3.6	1.91	2	Y
Total Metals							
Arsenic	5	1	1.02	23.5	23	10	Y
Barium	7	12	4.19	3,600	860	2,000	Y
Chromium	6	10	5.57	610	109.5	100	Y
Lead	7	9	1.62	47.6	29.47	15	Y
Manganese	1	1	1.00	1,300	1,300	50	Y

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 9B-10
Groundwater Constituent of Concern Summary for Sub-area 8B: Office Complex North
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
Bromomethane	8	1	1.40	1.8	1.29	10	N
Polynuclear Aromatic Hydrocabons (PAHs)							
None	4	0	N/A	ND	N/A	N/A	N/A
Polychlorinated Biphenyls (PCBs)							
None	4	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	5	2	1.29	64,000	49,500	NA	N/A
TPH GRO	4	0	N/A	ND	250	NA	N/A
TPH ORO	1	1	1.00	32,000	32,000	NA	N/A
Total Metals							
Arsenic	5	3	2.36	34.9	14.79	10	Y
Barium	5	7	1.84	783	425.5	2,000	N
Chromium	5	7	2.97	153	51.44	100	Y
Lead	5	6	2.61	49.3	18.92	15	Y
Mercury	5	1	1.09	0.11	0.10	2	N

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 9C-10
Groundwater Constituent of Concern Summary for Sub-area 8C: Office Complex North
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
None	2	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	3	0	N/A	ND	250	NA	N/A
TPH GRO	3	1	1.00	650	650	NA	N/A

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 9A-11(a)

Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker

Sub-area 8A: Office Complex North, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc. (ug/kg)	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
		IELCR	HQ		IELCR	HQ		
Toluene	---	---	---	1.5	NA	2.37E-07	NA	2.37E-07
Trichloroethene	40	3.11E-10	1.46E-05	110	6.07E-09	2.85E-04	6.38E-09	3.00E-04
Vinyl chloride	---	---	---	1.9	1.73E-08	5.67E-06	1.73E-08	5.67E-06
Organics Total Risk		**3.11E-10**	**1.46E-05**		**2.34E-08**	**2.91E-04**	**2.37E-08**	**3.06E-04**
Arsenic	12,500	NA	NA	23	NA	NA	NA	NA
Barium	---	---	---	860	NA	NA	NA	NA
Chromium	---	---	---	110	NA	NA	NA	NA
Manganese	---	---	---	1,300	NA	NA	NA	NA
Mercury	38	NA	1.09E-04	---	---	---	NA	1.09E-04
Metals Total Risk		**NA**	**NA**		**NA**	**NA**	**NA**	**NA**
CUMULATIVE RISK		**3.11E-10**	**1.46E-05**		**2.34E-08**	**2.91E-04**	**2.37E-08**	**3.06E-04**

Notes:

NA: Not available

---: Risk evaluation was not performed.

HI: Hazard index

ug/kg: Micrograms per kilogram

ug/L: Micrograms per liter

Table 9A-11(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 8A: Office Complex North, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
Acetone	71	NA	2.48E-07	NA	2.62E-07	NA	6.17E-07	—	—	—	—	—	NA	1.13E-06
cis-1,2-Dichloroethene	38	NA	1.34E-07	NA	1.49E-06	NA	7.54E-06	—	—	—	—	—	NA	9.16E-06
Methyl ethyl ketone (MEK)	61	NA	3.56E-08	NA	3.96E-08	NA	1.38E-07	—	—	—	—	—	NA	2.13E-07
Methylene Chloride	7.3	2.71E-13	4.21E-08	3.01E-13	4.68E-08	4.52E-13	2.24E-08	—	—	—	—	—	1.02E-12	1.11E-07
Trichloroethene	34	3.13E-15	3.32E-09	2.09E-12	2.21E-06	4.54E-12	5.33E-06	110	6.15E-09	6.52E-03	4.90E-12	5.75E-06	6.16E-09	6.53E-03
Toluene	—	—	—	—	—	—	—	1.5	NA	7.27E-06	NA	5.17E-09	NA	7.28E-06
Vinyl chloride	—	—	—	—	—	—	—	1.9	8.38E-09	1.03E-04	1.07E-11	8.72E-08	8.39E-09	1.03E-04
Organics Total Risk		2.74E-13	4.63E-07	2.39E-12	4.05E-06	4.99E-12	1.36E-05		1.45E-08	6.63E-03	1.56E-11	5.84E-06	1.46E-08	6.65E-03
Arsenic	11,057	2.75E-10	4.28E-05	8.72E-08	1.36E-02	1.45E-10	2.26E-06	23	NA	NA	NA	NA	8.76E-08	1.36E-02
Barium	—	—	—	—	—	—	—	860	NA	NA	NA	NA	NA	NA
Chromium	—	—	—	—	—	—	—	110	NA	NA	NA	NA	NA	NA
Manganese	—	—	—	—	—	—	—	1,300	NA	NA	NA	NA	NA	NA
Mercury	43	NA	1.66E-07	NA	8.30E-06	NA	2.00E-04	—	—	—	—	—	NA	2.09E-04
Organics Total Risk		2.75E-10	4.30E-05	8.72E-08	1.36E-02	1.45E-10	2.02E-04		NA	NA	NA	NA	8.76E-08	1.38E-02
CUMULATIVE RISK		2.76E-10	4.35E-05	8.72E-08	1.36E-02	1.50E-10	2.16E-04		1.45E-08	6.63E-03	1.56E-11	5.84E-06	1.02E-07	2.05E-02

Notes:
NA: Not available
—: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic
ORO: Oil range organic
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter

Table 9B-11(a)

Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker

Sub-area 8B: Office Complex North, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ		IELCR	HQ		
Aliphatics > nC6 to nC8 (TX1006)	—	—	—	83	NA	4.87E-05	NA	4.87E-05
Aliphatics > nC8 to nC10 (TX1006)	—	—	—	83	NA	1.43E-03	NA	1.43E-03
Aromatics > nC8 to nC10 (TX1006)	—	—	—	83	NA	4.67E-05	NA	4.67E-05
TPH-GRO	—	—	—	250	NA	1.53E-03	NA	1.53E-03
Aliphatics > nC10 to nC12 (TX1006)	—	—	—	467	NA	1.20E-02	NA	1.20E-02
Aliphatics > nC12 to nC16 (TX1006)	—	—	—	9,340	NA	1.04E+00	NA	1.04E+00
Aliphatics > nC16 to nC21 (TX1006)	—	—	—	28,019	NA	2.95E+01	NA	2.95E+01
Aromatics > nC10 to nC12 (TX1006)	—	—	—	467	NA	8.46E-05	NA	8.46E-05
Aromatics > nC12 to nC16 (TX1006)	—	—	—	3,736	NA	2.82E-04	NA	2.82E-04
Aromatics > nC16 to nC21 (TX1006)	—	—	—	7,472	NA	1.57E-04	NA	1.57E-04
TPH-DRO	—	—	—	49,500	NA	3.05E+01	NA	3.05E+01
Aliphatics > nC21 to nC35 (TX1006)	—	—	—	22,857	NA	2.41E+01	NA	2.41E+01
Aromatics > nC21 to nC35 (TX1006)	—	—	—	9,143	NA	2.23E-05	NA	2.23E-05
TPH-ORO	—	—	—	32,000	NA	2.41E+01	NA	2.41E+01
TPH Total Risk		NA	NA		NA	5.46E+01	NA	5.46E+01
Arsenic	—	—	—	15	NA	NA	NA	NA
Chromium	—	—	—	51	NA	NA	NA	NA
Metals Total Risk		NA	NA		NA	NA	NA	NA
CUMULATIVE RISK		NA	NA		NA	5.46E+01	NA	5.46E+01

Notes:

NA: Not available

—: Risk evaluation was not performed.

HI: Hazard index

TPH: Total petroleum hydrocarbon

DRO: Diesel range organic

GRO: Gasoline range organic

ORO: Oil range organic

ug/kg: Micrograms per kilogram

ug/L: Micrograms per liter

Table 9B-11(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 8B: Office Complex North, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
Methyl ethyl ketone (MEK)	10	NA	5.81E-09	NA	6.46E-09	NA	2.25E-08	---	---	---	---	---	NA	3.48E-08
Benzo(b)fluoranthene	66	1.04E-10	NA	2.67E-10	NA	8.95E-13	NA	---	---	---	---	---	3.72E-10	NA
Chrysene	44	6.93E-13	NA	1.78E-12	NA	1.02E-14	NA	---	---	---	---	---	2.48E-12	NA
Organics Total Risk		**1.05E-10**	**5.81E-09**	**2.68E-10**	**6.46E-09**	**9.05E-13**	**2.25E-08**		**NA**	**NA**	**NA**	**NA**	**3.74E-10**	**3.48E-08**
Aliphatics > nC6 to nC8 (TX1006)	---	---	---	---	---	---	---	83	NA	NA	NA	4.35E-07	NA	4.35E-07
Aliphatics > nC8 to nC10 (TX1006)	---	---	---	---	---	---	---	83	NA	NA	NA	1.28E-05	NA	1.28E-05
Aromatics > nC8 to nC10 (TX1006)	---	---	---	---	---	---	---	83	NA	NA	NA	5.04E-07	NA	5.04E-07
TPH-GRO	---	---	---	---	---	---	---	**250**	**NA**	**NA**	**NA**	**1.37E-05**	**NA**	**1.37E-05**
Aliphatics > nC10 to nC12 (TX1006)	---	---	---	---	---	---	---	467	NA	NA	NA	1.07E-04	NA	1.07E-04
Aliphatics > nC12 to nC16 (TX1006)	---	---	---	---	---	---	---	9,340	NA	NA	NA	9.29E-03	NA	9.29E-03
Aliphatics > nC16 to nC21 (TX1006)	---	---	---	---	---	---	---	28,019	NA	NA	NA	2.63E-01	NA	2.63E-01
Aromatics > nC10 to nC12 (TX1006)	---	---	---	---	---	---	---	467	NA	NA	NA	1.30E-06	NA	1.30E-06
Aromatics > nC12 to nC16 (TX1006)	---	---	---	---	---	---	---	3,736	NA	NA	NA	7.29E-06	NA	7.29E-06
Aromatics > nC16 to nC21 (TX1006)	---	---	---	---	---	---	---	7,472	NA	NA	NA	1.17E-05	NA	1.17E-05
TPH-DRO	---	---	---	---	---	---	---	**49,500**	**NA**	**NA**	**NA**	**2.72E-01**	**NA**	**2.72E-01**
Aliphatics > nC21 to nC35 (TX1006)	---	---	---	---	---	---	---	22,857	NA	NA	NA	2.14E-01	NA	2.14E-01
Aromatics > nC21 to nC35 (TX1006)	---	---	---	---	---	---	---	9,143	NA	NA	NA	1.33E-05	NA	1.33E-05
TPH-ORO	---	---	---	---	---	---	---	**32,000**	**NA**	**NA**	**NA**	**2.14E-01**	**NA**	**2.14E-01**
TPH Total Risk		**NA**	**NA**	**NA**	**NA**	**NA**	**NA**		**NA**	**NA**	**NA**	**4.86E-01**	**NA**	**4.86E-01**
Arsenic	---	---	---	---	---	---	---	15	NA	NA	NA	NA	NA	NA
Chromium	---	---	---	---	---	---	---	51	NA	NA	NA	NA	NA	NA
Mercury	---	---	---	---	---	---	---	---	---	---	---	---	NA	NA
Organics Total Risk		**NA**	**NA**	**NA**	**NA**	**NA**	**NA**		**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
CUMULATIVE RISK		**1.05E-10**	**5.81E-09**	**2.68E-10**	**6.46E-09**	**9.05E-13**	**2.25E-08**		**NA**	**NA**	**NA**	**4.86E-01**	**3.74E-10**	**4.86E-01**

Notes:
NA: Not available
---: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
DRO: Diesel range organic
GRO: Gasoline range organic
ORO: Oil range organic
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter

Table 9C-11(a)

Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker

Sub-area 8C: Office Complex North, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc. (ug/kg)	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
		IELCR	HQ		IELCR	HQ		
TPH-GRO	---	---	---	650	NA	4.72E-03	NA	4.72E-03
TPH-DRO	---	---	---	250	NA	5.90E-02	NA	5.90E-02
TPH Total Risk		**NA**	**NA**		**NA**	**6.38E-02**	**NA**	**6.38E-02**
CUMULATIVE RISK		**NA**	**NA**		**NA**	**6.38E-02**	**NA**	**6.38E-02**

Notes:

NA: Not available

---: Risk evaluation was not performed.

HI: Hazard index

TPH: Total petroleum hydrocarbon

DRO: Diesel range organic

GRO: Gasoline range organic

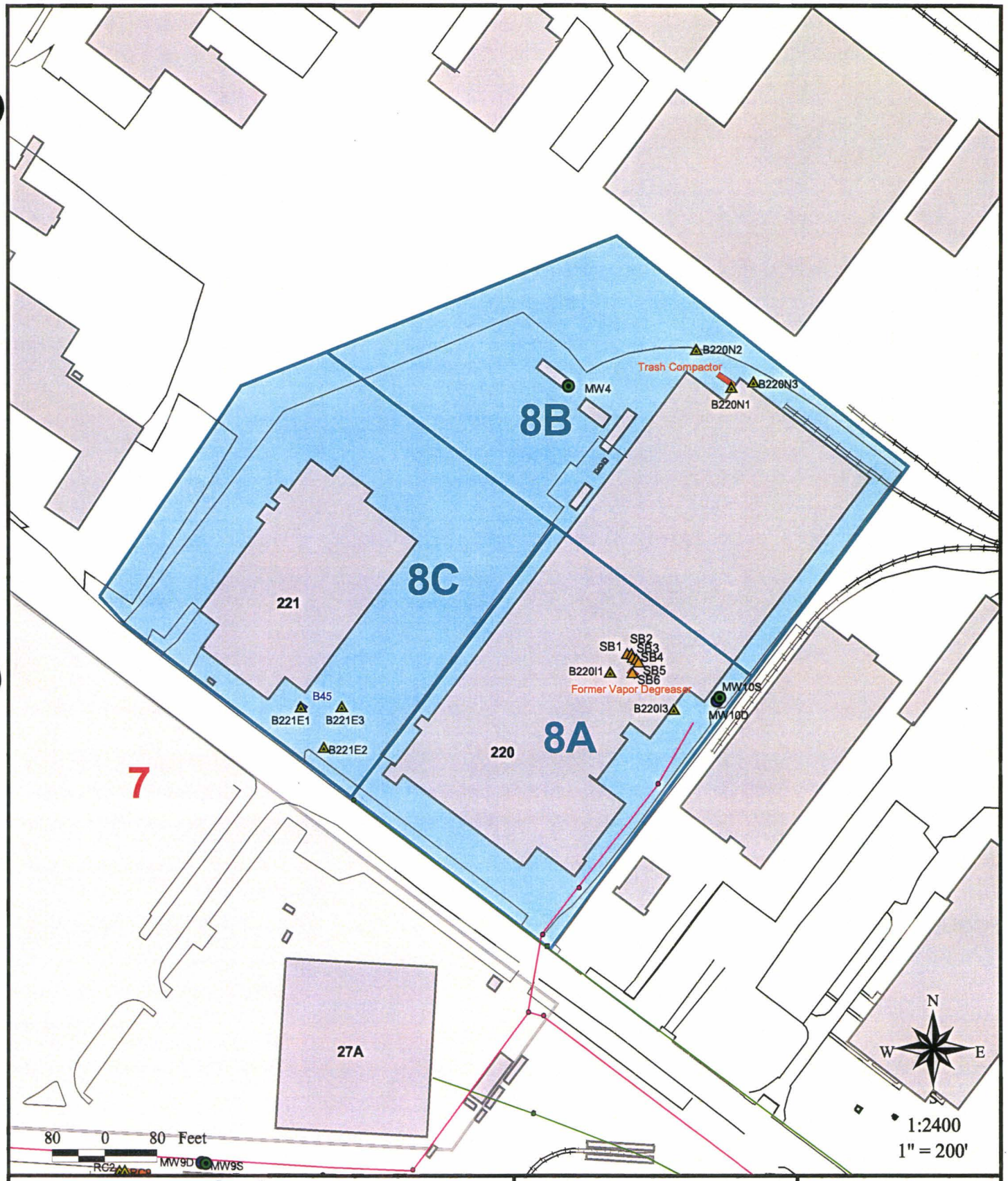
ug/kg: Micrograms per kilogram

ug/L: Micrograms per liter

Table 9C-11(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Sub-area 8C: Office Complex North, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
Acetone	67	NA	2.34E-07	NA	2.47E-07	NA	5.80E-07	---	---	---	---	---	NA	1.06E-06
Tetrachloroethene	3.4	8.68E-14	1.17E-08	9.64E-13	1.30E-07	1.99E-13	6.00E-08	---	---	---	---	---	1.25E-12	2.01E-07
Organics Total Risk		**8.68E-14**	**2.45E-07**	**9.64E-13**	**3.76E-07**	**1.99E-13**	**6.40E-07**		**NA**	**NA**	**NA**	**NA**	**1.25E-12**	**1.26E-06**
TPH-GRO	2,096	NA	NA	NA	9.53E-06	NA	1.23E-05	650	NA	NA	NA	7.24E-05	NA	9.42E-05
TPH-DRO	390,375	NA	8.61E-04	NA	2.62E-03	NA	7.49E-04	250	NA	NA	NA	8.97E-04	NA	5.12E-03
TPH Total Risk		**NA**	**8.61E-04**	**NA**	**2.63E-03**	**NA**	**7.62E-04**		**NA**	**NA**	**NA**	**9.69E-04**	**NA**	**5.22E-03**
CUMULATIVE RISK		**8.68E-14**	**8.61E-04**	**9.64E-13**	**2.63E-03**	**1.99E-13**	**7.62E-04**		**NA**	**NA**	**NA**	**9.69E-04**	**1.25E-12**	**5.22E-03**

Notes:
NA: Not available
---: Risk evaluation was not performed.
HI: Hazard index
TPH: Total petroleum hydrocarbon
GRO: Gasoline range organic
DRO: Diesel range organic
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter



Legend

- Other Shallow Boring
- RFI Shallow Boring
- RFI Shallow Boring/Temp. Piezometer
- RFA Boring
- Abandoned Shallow Piezometer
- Abandoned Shallow Well
- RFI Deep Boring/Temp. Piezometer
- Industrial Sewer Line
- Sanitary Waste Line
- Manhole (Type by Color)
- UST
- SWMU

Drawn by: BSM Approved by:

Checked by: Date: September 13, 2004

Risk Assessment & Management Group, Inc.

Figure 9-1
Exposure Area 8:
Sub Areas:
8A, 8B, & 8C
Office Complex North,
Boeing Tract 1 North

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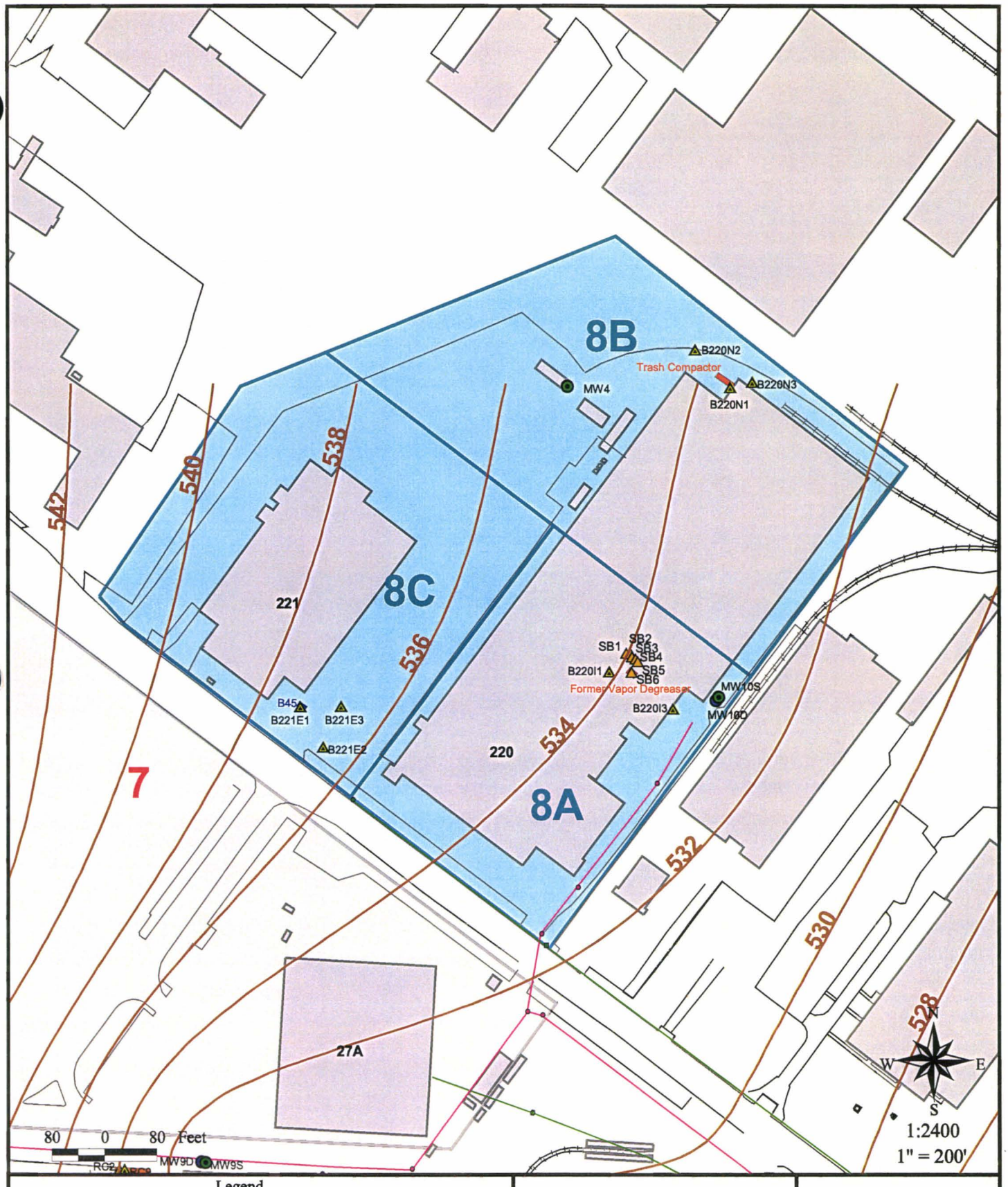

Legend

- Other Shallow Boring
- RFI Shallow Boring
- RFI Shallow Boring/Temp. Piezometer
- RFA Boring
- Abandoned Shallow Piezometer
- Abandoned Shallow Well
- RFI Deep Boring/Temp. Piezometer
- Shallow Groundwater Isopleth
- Industrial Sewer Line
- Sanitary Waste Line
- Manhole (Type by Color)
- UST
- SWMU

Drawn by: BSM Approved by:

Checked by: Date: September 13, 2004

Risk Assessment & Management Group, Inc.

Figure 9-2
Shallow Groundwater Isopleth Map For Area 8: Office Complex North, Boeing Tract 1 North

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ATTACHMENT 9-A

ECOLOGICAL RISK ASSESSMENT – AREA 8 OFFICE COMPLEX NORTH TIER 1 SCREENING CHECKLIST FOR POTENTIAL RECEPTORS AND HABITAT CHECKLIST #1

1. Is the site less than ½ mile to a surface water resource (pond, river, lake, etc.)?

   Yes, the downgradient edge of Area 8 is about 1,600 feet northwest of Coldwater Creek, and the northwest corner of Area 8 is about 500 feet southwest of a tributary to Coldwater Creek.

2. Are wetlands (e.g. marshes, swamps, fens) on or adjacent to the site?

   No.

3. Are contaminated soils uncovered or otherwise accessible to ecological receptors and the elements?

   No, the impacted areas of the site are paved.

4. Has a process (operational) discharge or storm water permit not been issued for the site?

   Site-wide, there is a storm water permit.

5. Is the site located in a known Karst environment (see Reference map)?

   No.

6. Are there federal or state rare, threatened, or endangered species on or within a ½ mile radius of the site? Note, the ½ mile radius limit does not necessarily apply to situations where a hydrogeological connection exists between the site and karsitic features.

   No.

7. Are there one or more environmentally sensitive areas (see Ecological Risk Assessment Figure #1 for definition) at or within a ½ mile radius of the site?

   No.

8. Are commercially or recreationally important species (fauna or flora) on or within a ½ mile radius of the site?

   No.

ATTACHMENT 9-B

ECOLOGICAL RISK ASSESSMENT – AREA 8 OFFICE COMPLEX NORTH TIER 1 SCREENING CHECKLIST FOR POTENTIAL RECEPTORS AND HABITAT CHECKLIST #2

1a. Can contaminants associated with the site leach, dissolve, or otherwise migrate to groundwater?

Yes, groundwater has been impacted.

1b. Are contaminants associated with the site mobile in groundwater?

Yes.

1c. Does groundwater from the site discharge into to ecological receptor habitat?

Eventually groundwater could discharge into Coldwater Creek.

1. Could contaminants associated with the site reach ecological receptors via groundwater?

Based on the distance to the creek and the current groundwater concentrations, it is very unlikely that impacted groundwater from Area 8 could reach the creek.

2a. Is NAPL present at the site?

No.

2b. Is NAPL migrating?

No.

2c. Could NAPL discharge occur where ecological receptors are found?

No.

2. Could contaminants from the site reach ecological receptors via migration of NAPL?

No.

3a. Are contaminants present in surface soils?

Yes, under the building 220 floor slab.

3b. Can contaminants be leached from or be transported by erosion of surface soils?

No, the impacted areas of the site are paved.

3. Could contaminants reach ecological receptors via erosional transport of contaminated soil or via precipitation runoff?

No, the impacted areas of the site are paved.

4a. Are contaminants present in surface soil or on the surface of the ground?

Only impacted surficial soils are under the Building 220 floor slab.

4b. Are potential ecological receptors on the site?

No.

4. Could contaminants reach ecological receptors via direct contact?

No, the impacted areas of the site are paved.

5a. Are contaminants present on the site volatile?

Yes.

5b. Could contaminants on the site be transported in air as dust or particulate matter?

No, the impacted areas of the site are paved.

5. Could contaminants reach ecological receptors via inhalation of volatilized contaminants or contaminants adhered to dust in ambient air or in subsurface burrows?

No, the impacted areas of sites are paved.

6a. Are contaminants present in surface and shallow subsurface soils or on the surface of the ground?

Only impacted surficial soils are under the Building 220 floor slab..

6b. Are contaminants found in soil on the site taken up by plants growing on the site?

No, the impacted areas of the site are paved.

6c. Do potential ecological receptors on or near the site feed on plants found on the site?

No, the impacted areas of site are paved.

6d. Do contaminants found on the site bioaccumulate?

No.

6. Could contaminants reach ecological receptors via ingestion of either soil, plants, animals, or contaminants directly?

No.

7a. Are there Karsitic features on or within a ½ mile radius of the site?

No.

7b. Is there a hydrogeological connection between the site and karsitic features such as seeps, springs, streams, or other surface water bodies?

No.

7. Could contaminants reach ecological receptors via transport through a Karst system?

No.

Section
10.0

10.1 INTRODUCTION

The Gun Range, also referred to as Area 9, is located in the southeastern portion of the Facility, adjacent and south of the Norfolk and Western Railroad Company railroad tracks and Banshee Road, and is bounded on the southwest by Area 3, on the west by Area 4, on the east by Area 5, and on the southeast by the Airport runway (see Figure 10-1). This section describes the constituents in this Area, the exposure model, the evaluation of the current and future risk to human health and the environment, and conclusions based on the results of the risk evaluation.

10.2 DESCRIPTION OF AREA

The Gun Range is an area approximately 600 feet long by 500 feet wide. Within this Area, there are five main buildings and a parking lot.

10.2.1 Potential Sources within Area

The following SWMU was identified in this Area during the RFA investigation (SAIC, 1995):

- SWMU 7: Explosive waste storage area inside Building 10.

Hence, within this Area, we anticipate constituents of concern to be organics and metals.

10.2.2 Soil Stratigraphy within Area

There are six soil borings within this Area, see Table 10-1 for further details of these borings. Based on the soil boring logs, the soil stratigraphy within this Area is clay, silty clay, and clayey silt from approximately 2 feet bgs to 24 feet bgs. For additional details, refer to the RFI (MACTEC, 2004). No borings deeper than 24 feet were advanced in this Area. Based on borings outside this Area, bedrock is at approximately 80 feet bgs (which consists of limestone). No karst features have been identified in this Area. For calculation of risk to indoor inhalation, a depth of 12 feet (365.76 cm) to soil source was used (see Table 1-9).

10.2.3 Hydrogeology within Area

There are no monitoring wells located within this Area. Based on recent (since 2000) groundwater gauging data in monitoring wells outside this Area, groundwater flow within the shallow zone is typically toward Coldwater Creek, which is located in an enclosed culvert below the western portion of this Area; therefore, it is difficult to know the shallow groundwater flow direction in this Area. Based on the soil boring logs, shallow groundwater appears to be present at about 12 feet bgs. To evaluate risk to indoor inhalation, an average depth of 12 feet (365.76 cm) to groundwater was used (see Table 1-13).

10.3 LAND USE

10.3.1 Current Land Use

The current land use is non-residential. The Area is owned by the St. Louis Airport Authority and is currently leased by Boeing. It was previously used as a gun range, FOR TESTING AIRCRAFT WEAPONS. Boeing intends to vacate the Area in the near future.

10.3.2 Future Land Use

Future land use, based on information obtained from the St. Louis Airport Authority, will be non-residential.

10.4 AVAILABLE DATA

The following provides an overview of the available data within the Area:

- Six soil borings have been sampled within this Area since November 2002 resulting in eight individual soil samples including one duplicate.
- All six soil borings were completed as piezometers in this Area and have been sampled for groundwater up to two times for selected constituents during November 2002 and July 2004.

10.5 CONSTITUENTS IDENTIFIED WITHIN AREA

10.5.1 Soil

Two soil sampling events (November 2002 and July 2004) have resulted in eight soil samples collected within Area 9. These samples have been analyzed for a comprehensive list of constituents that included VOCs, SVOCs including PAHs, TPH, and metals. Typical laboratory methods that were used include SW 846 Methods 6010, 7471, 8260, 8270, OA1, and OA2. Appendix J-1 includes a comprehensive table of the laboratory data for constituents detected at least once in soil samples from Area 9. Table 10-2 presents a listing of the soil samples used in the risk calculations. Evaluation of the data in Tables 10-3(a), 10-3(b) and 10-3(c) indicated that the following 18 constituents were detected in at least one soil sample:

METALS		ORGANICS/TPH
Arsenic	Manganese	Acetone
Barium	Mercury	Methylene Chloride
Beryllium	Nickel	Naphthalene
Cadmium	Selenium	Toluene
Chromium	Silver	TPH (1 type)
Copper	Zinc	
Lead		

The data was further screened for potential exposures to the non-residential worker and construction worker.

Non-residential Worker

The non-residential worker data are constituents in soil samples collected above the groundwater table. The data for soil samples collected in this Area at or above a depth of 12 feet bgs were used.

The maximum detected concentrations of metals were compared with the background levels. Metals whose maximum detected concentrations did not exceed the background levels were eliminated from further consideration and included arsenic, barium, beryllium, chromium, lead, mercury and silver. The following nine constituents were considered further:

METALS		ORGANICS
Cadmium	Nickel	Acetone
Copper	Selenium	Methylene Chloride
Manganese	Zinc	Naphthalene

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for soil exposures to the non-residential worker.

Construction Worker

The construction worker data are constituents in soil samples collected above the typical construction depth. To be conservative, soil samples collected at or above a depth of 20 feet bgs are included.

The maximum detected concentrations of metals were compared with the background levels. Metals whose maximum detected concentrations did not exceed the background levels were eliminated from further consideration and included arsenic, barium, beryllium, chromium, lead, mercury and silver. The following 11 constituents were considered further:

METALS		VOCs/TPH
Cadmium	Nickel	Acetone
Copper	Selenium	Methylene Chloride
Manganese	Zinc	Naphthalene
		Toluene
		TPH (1 type)

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for soil exposures to the construction worker.

10.5.2 Groundwater

During the various investigations conducted within this Area, groundwater samples were analyzed for a comprehensive list of constituents that included VOCs, SVOCs including PAHs, TPH, and metals using laboratory analysis SW 846 Methods 6010, 7470, 8260, 8270, OA1, and

OA2. Appendix J-2 includes a comprehensive list of the groundwater analytical data. Table 10-4 presents a listing of the groundwater samples used in the risk calculations.

Evaluation of the data in Tables 10-5(a) and 10-5(b) indicated that the following 11 constituents were detected in at least one groundwater sample:

METALS		TPH
Arsenic	Lead	TPH (2 types)
Barium	Manganese	
Beryllium	Nickel	
Chromium	Silver	
Copper	Zinc	

The maximum detected concentration for each constituent was compared with various screening criteria. Constituents for which the screening criteria exceeded the maximum detected concentration were eliminated from further consideration. These included barium, beryllium, chromium, copper, nickel, silver, and zinc. Note as discussed in Section 1.9.11, lead was also eliminated. The remaining constituents consist of two metals and TPH. These constituents are listed in the following table:

METALS	TPH
Arsenic	TPH (2 types)
Manganese	

Based on this evaluation, the constituents listed above were considered for quantitative risk evaluation for groundwater exposures.

10.6 FREE PRODUCT

Free product has not been observed within this area.

10.7 EXPOSURE MODEL

10.7.1 Current Conditions

This Area is comprised of the Gun Range buildings and parking lots. Hence, the receptors under current conditions would be the non-residential worker and a visitor/maintenance worker to the area.

Exhibit 10-1 presents the EM for the current non-residential worker. As the exposure duration for the visitor/maintenance worker is less than that for the commercial worker, the risk from any soil or groundwater impact will not be quantitatively evaluated.

EXHIBIT 10-1. EM FOR CURRENT ON-SITE NON-RESIDENTIAL WORKER		
Scenario, Receptor, and Pathways / Routes Analyzed	**C or NC**	**Justification**
Dermal Contact with Surficial Soil	NC	The area is partially paved, but surficial soil is not impacted; therefore, this pathway is incomplete.
Ingestion of Surficial Soil	NC	The area is partially paved, but surficial soil is not impacted; therefore, this pathway is incomplete.
Indoor Inhalation of Vapors from Subsurface Soil	C	**Volatile constituents were detected in soils in this area; therefore, this pathway is complete.**
Indoor Inhalation of Vapors from Groundwater	C	**Vapors from groundwater may migrate into the buildings; hence, this pathway is complete.**
Notes: **NC:** Not Complete **C:** Complete Exposure pathways highlighted in bold indicate that these pathways are complete and will be quantitatively evaluated.		

10.7.2 Future Conditions

Under future conditions, the land use in this Area is not expected to alter; hence, the receptors will remain the same in the future. As such, the risks will not be quantitatively evaluated, as the comparison for the current conditions will be protective of the future non-residential worker. Groundwater concentrations are expected to decrease in the future through natural attenuation processes, further reducing the risk.

In the future, construction work could be performed within this area; therefore, the potential future construction worker is a receptor. Exhibit 10-2 presents the EM for the construction worker.

EXHIBIT 10-2. EM FOR POTENTIAL FUTURE CONSTRUCTION WORKER		
Scenario, Receptor, and Pathways/Routes Analyzed	**C or NC**	**Justification**
Dermal Contact with Soil	**C**	**Soil is impacted at depths less than 20 feet, which is considered the construction zone; therefore, contact is possible.**
Accidental Ingestion of Soil	**C**	**Soil is impacted at depths less than 20 feet, which is considered the construction zone; therefore, ingestion is possible.**
Outdoor Inhalation of Vapors and Particulates from Soil	**C**	**Soil is impacted within this area, and some of the constituents identified are volatile; therefore, this pathway is complete.**
Dermal Contact with Groundwater	**C**	**A construction worker may come in contact with groundwater located at a depth of about 12 feet bgs. Therefore, this pathway is considered complete.**
Outdoor Inhalation of Vapors from Groundwater	**C**	**Vapors from groundwater may migrate upwards through the unsaturated zone and into the ambient air. Hence, this pathway is complete.**
Notes: **NC:** Not Complete **C:** Complete Exposure pathways highlighted in bold indicate that these pathways are complete and will be quantitatively evaluated.		

10.8 REPRESENTATIVE CONCENTRATIONS

Representative concentrations for this Area were determined to be the Area-wide average in soil and groundwater. This was chosen as the sampling activities that have been performed have all been within the areas of most impact; therefore, the mean concentration represents a conservative estimate of the overall impact to the Area. Additionally, no information is known regarding the likely future location of a building; therefore, it is prudent to identify the source areas as the representative concentration.

Tables 10-6(a), 10-6(b), and 10-7 present the soil and groundwater average and maximum concentrations. The ratio of the maximum detected concentration to average concentration is also presented. No constituents exceeded a ratio of 10.

10.9 CALCULATION OF RISK

Tables 10-8(a) and 10-8(b) present the results for the non-residential worker and construction worker, respectively. The tables present the carcinogenic (IELCR) and non-carcinogenic (HQ and HI) risks for:

- Each COC,

- Each route of exposure,
- Cumulative risk for each COC,
- Cumulative risk for each route of exposure, and
- Total risk, which is the sum of risk for all the COCs and all the routes of exposures.

Based on these tables, following are the key observations.

10.9.1 Non-residential Worker

Carcinogenic Risk:

As indicated in Table 10-8(a), the cumulative IELCR is 1.79×10^{-11} that is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 10-8(a) the cumulative HI for all COCs and all routes of exposure is 0.19, which is below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

10.9.2 Construction Worker

Carcinogenic Risk:

As indicated in Table 10-8(b), the cumulative IELCR is 1.29×10^{-11} that is well below the regulatory acceptable level of 1×10^{-4}. Since the cumulative risk is less than 1×10^{-5}, clearly the risk for each COC and routes of exposure is less than 1×10^{-5} – the regulatory acceptable level.

Non-carcinogenic Risk:

As shown in Table 10-8(b), the cumulative HI is 0.008, which is below the regulatory acceptable level of 1.0. Since the cumulative HI is less than 1, the HQ for each COC and each route of exposure, and hence each target organ would be less than 1.0 – the regulatory acceptable level.

10.10 ECOLOGICAL RISK

The only potential ecological receptor in the area is Coldwater Creek. Area 9 is located above a portion of Coldwater Creek that flows through an enclosed culvert, and about 100 feet south of the portion of Coldwater Creek that enters an open culvert and continues to flow north. There are no known unpermitted conduits present that could carry impacts from Area 9 to Coldwater Creek. Considering the geology and the chemical types and concentrations of impacts in Area 9, it is not likely that migration of impacts from Area 9 to Coldwater Creek will occur. The Tier 1 ecological screening checklists have been completed for this Area, and are presented as Attachment 10-A and Attachment 10-B. These checklists identified no potential ecological receptors or issues.

10.11 CONCLUSIONS

The calculated risks for all the COCs and all potentially complete routes of exposure for the construction worker and the non-residential worker are below the acceptable target risks.

Table 10-1
Soil Boring Information for Area 9: Gun Range
Boeing Tract 1, St. Louis, Missouri

Boring	Date Drilled
B10N1	7/24/2003
B10W1	7/24/2003
B11N1	7/24/2003
B13E1	11/21/2002
B13E2	11/21/2002
B13E3	11/21/2002

Table 10-2
Soil Samples Used in Average Concentration Calculations in Area 9: Gun Range
Boeing Tract 1, St. Louis, Missouri

	Volatile Organic Compounds		Total Petroleum Hydrocarbons		Polynuclear Aromatic Hydrocarbons		Polychlorinated Biphenyls		Metals	
	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker	Non-Residential Worker	Construction Worker
9	B10N1-12	B10N1-12		B10N1-20		B11N1-13			B10N1-12	B10N1-12
		B11N1-13							B10W1-8	B10N1-20
									B13E1-6	B10W1-8
									B13E2-6	B11N1-13
									B13E3-6	B13E1-6
										B13E2-6
										B13E3-6

Note:
- analysis type not performed

Table 10-3(a)
Soil Constituents Average Concentrations for VOCs in
Area 9: Gun Range
Boeing Tract 1, St. Louis, Missouri

Sample ID	VOCs (ug/kg)			
	ACETONE	METHYLENE CHLORIDE	NAPHTHALENE	TOLUENE
Non- Residential Worker				
B10N1-12	20	2.9	2.6	2.5
Average Concentration - Only Samples With VOC Detections	**20**	**2.9**	**2.6**	
Construction Worker				
B10N1-12	20	2.9	2.6	2.5
B10N1-20	8.6	2.8	5	2.5
B10W1-8	10	10	5	2.5
B11N1-13	13	10	217.1	6.3
Average Concentration - Only Samples With VOC Detections	**16.5**	**6.45**	**109.85**	**4.4**

Notes:

ug/kg - micrograms per kilogram

Groundwater table is at a depth of 12 feet below ground surface (bgs) for area.

Non Residential Worker - above groundwater table in the area

Construction Worker - above a depth of 20 feet bgs

VOCs - Volatile Organic Compounds

NA - Not Analyzed

No VOCs except acetone and/or methylene chloride detected in the sample

Table 10-3(b)
Soil Constituents Average Concentrations for TPHs in
Area 9: Gun Range, Construction Worker
Boeing Tract 1, St. Louis, Missouri

Constituent Fractions	B10N1-20	Overall Area Average (ug/kg)
TPH - DRO		TPH - DRO
7/24/2003	**2,520**	
AVERAGE TPH - DRO	2520	2,520
TPH - GRO		TPH - GRO
7/24/2003	500	
AVERAGE TPH - GRO	500	500
TPH - ORO		TPH - ORO
7/24/2003	3148	
AVERAGE TPH - ORO	3148	3,148

Notes:

Groundwater table is at a depth of 12 feet below ground surface (bgs) for area.

Non Residential Worker - above groundwater table in the area

Construction Worker - above a depth of 20 feet bgs

ug/kg - micrograms per kilogram

TPH - Total petroleum hydrocarbon

DRO - Diesel range organic

GRO - Gasoline range organic

ORO - Oil range organic

Bold indicates a detection

NA - Not analyzed

Table 10-3(c)
Soil Constituents Average Concentrations for Metals in Area 9: Gun Range, Non-Residential Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)												
	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COPPER	LEAD	MANGANESE	MERCURY	NICKEL	SELENIUM	SILVER	ZINC
B10N1-12	5,940	231,000	611	1,210	12,800	17,700	9,260	1,178,000	50	20,100	2,350	456	63,700
B10W1-8	NA	NA	NA	NA	NA	NA	8,400	NA	NA	NA	NA	NA	NA
B13E1-6	2,400	120,000	NA	480	10,000	NA	9,800	NA	22	NA	250	260	NA
B13E2-6	250	92,000	NA	125	9,300	NA	5,000	NA	24	NA	250	125	NA
B13E3-6	3,450	130,000	NA	238	9,950	NA	11,450	NA	28	NA	2,600	125	NA
Average Concentration - Only Samples With Metals Detections	**3,010**	**143,250**	**611**	**513.1**	**10,513**	**17,700**	**8,782**	**1,178,000**	**31**	**20,100**	**1,363**	**242**	**63,700**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 12 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 10-3(c)
Soil Constituents Average Concentrations for Metals in Sub-area 9A: Gun Range, Construction Worker
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/kg)												
	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COPPER	LEAD	MANGANESE	MERCURY	NICKEL	SELENIUM	SILVER	ZINC
B10N1-12	5,940	231,000	611	1,210	12,800	17,700	9,260	1,178,000	50	20,100	2,350	456	63,700
B10N1-20	3,490	47,500	426	200	7,850	8,640	6,470	45,100	50	5,820	6,610	200	21,400
B10W1-8	NA	NA	NA	NA	NA	NA	8,400	NA	NA	NA	NA	NA	NA
B11N1-13	NA	NA	NA	NA	NA	NA	8,560	NA	NA	NA	NA	NA	NA
B13E1-6	2,400	120,000	NA	480	10,000	NA	9,800	NA	22	NA	250	260	NA
B13E2-6	250	92,000	NA	125	9,300	NA	5,000	NA	24	NA	250	125	NA
B13E3-6	3,450	130,000	NA	238	9,950	NA	11,450	NA	28	NA	2,600	125	NA
Average Concentration - Only Samples With Metals Detections	**3,106**	**124,100**	**519**	**450.5**	**9,980**	**13,170**	**8,420**	**611,550**	**35**	**12,960**	**2,412**	**233**	**42,550**

Notes:
ug/kg - micrograms per kilogram
Groundwater table is at a depth of 12 feet below ground surface (bgs) for area.
Non Residential Worker - above groundwater table in the area
Construction Worker - above a depth of 20 feet bgs
NA - Not Analyzed

Table 10-4
Groundwater Samples Used in Average Concentration Calculations in Area 9: Gun Range
Boeing Tract 1, St. Louis, Missouri

	Volatile Organic Compounds	Total Petroleum Hydrocarbons	Polynuclear Aromatic Hydrocarbons	Polychlorinated Biphenyls	Metals
9		B10N1W	B11N1W		B10N1W
		B10W1W			B10W1W
		B11N1W			B11N1W
					B13E1W
					B13E2W
					B13E3W

Note:
- analysis type not performed

Table 10-5(a)
Groundwater Constituents Average Concentrations for TPHs in Area 9: Gun Range
Boeing Tract 1, St. Louis, Missouri

Constituent Fraction by Sample Event	B10N1W	B10W1W	B11N1W	Overall Area Average (ug/l)
TPH-DRO				**TPH-DRO**
7/24/2003	NA	**253**	**60**	
7/28/2003	50	NA	NA	
AVERAGE	50	253	60	**121**
TPH-GRO				**TPH-GRO**
7/24/2003	NA	500	500	
7/25/2003	500	NA	NA	
AVERAGE	500	500	500	**500**
TPH-ORO				**TPH-ORO**
7/24/2003	NA	75	**229**	
7/28/2003	**629**	NA	NA	
AVERAGE	629	75	229	**311**

Notes:
ug/l - micrograms per liter
TPH - Total petroleum hydrocarbon
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
Bold indicates a detection
NA - Not analyzed

Table 10-5(b)
Groundwater Constituents Average Concentrations for Metals in Area 9: Gun Range
Boeing Tract 1, St. Louis, Missouri

Sample ID	Metals (ug/l)									
	ARSENIC	BARIUM	BERYLLIUM	CHROMIUM	COPPER	LEAD	MANGANESE	NICKEL	SILVER	ZINC
B10N1W	15	**371**	**2**	**13**	**44**	22	**1750**	**33**	**2**	**229**
B10W1W	NA	NA	NA	NA	NA	22	NA	NA	NA	NA
B11N1W	NA	NA	NA	NA	NA	22	NA	NA	NA	NA
B13E1W	**17**	**370**	NA	5	NA	**9.2**	NA	NA	**6.6**	NA
B13E2W	**55**	**520**	NA	5	NA	**23**	NA	NA	2.5	NA
B13E3W	**62**	**520**	NA	5	NA	**21**	NA	NA	2.5	NA
Average Concentration - Only Samples With Metals Detections	**37.25**	**445.25**	**2.00**	**7.00**	**44.00**	**19.87**	**1,750**	**33.00**	**3.40**	**229.00**

Notes:
ug/l - micrograms per liter
NA - Not Analyzed
Bold indicates a detection

Table 10-6(a)
Soil Constituents of Concern Summary for Non-Residential Worker for Area 9: Gun Range
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			Max Detected Exceeds Background
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	
Volatile Organic Compounds (VOCs)							
Acetone	2	2	1.00	20	20.00	NA	N/A
Methylene chloride	2	1	1.00	2.9	2.90	NA	N/A
Naphthalene	2	1	1.00	2.6	2.60	NA	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	2	0	N/A	N/A	N/A	NA	N/A
TPH GRO	2	0	N/A	N/A	N/A	NA	N/A
TPH ORO	2	0	N/A	N/A	N/A	NA	N/A
Total Metals							
Arsenic	5	4	1.97	5,940	3,010	9,200	N
Barium	5	5	1.61	231,000	143,250	725,000	N
Beryllium	1	1	1.00	611	611	800	N
Cadmium	5	3	2.36	1,210	513.1	<1,000	Y
Chromium	5	5	1.22	12,800	10,513	58,000	N
Copper	1	1	1.00	17,700	17,700	13,000	Y
Lead	6	6	1.59	14,000	8,782	21,800	N
Manganese	1	1	1.00	1,178,000	1,178,000	740,000	Y
Mercury	5	4	1.10	34	31	39	N
Nickel	1	1	1.00	20,100	20,100	14,000	Y
Selenium	5	2	2.35	3,200	1,363	260	Y
Silver	5	2	1.89	456	242	<700	N
Zinc	1	1	1.00	63,700	63,700	49,000	Y

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 10-6(b)
Soil Constituents of Concern Summary for Construction Worker for Area 9: Gun Range
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/kg)	Average (ug/kg)	Background (ug/kg)	Max Detected Exceeds Background
Volatile Organic Compounds (VOCs)							
Acetone	4	4	1.21	20	16.50	NA	N/A
Methylene chloride	4	2	0.45	2.9	6.45	NA	N/A
Naphthalene	4	1	0.02	2.6	109.85	NA	N/A
Toluene	4	1	1.43	6.3	4.40	NA	N/A
Polynuclear Aromatic Hydrocabons (PAHs)							
None		0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	4	1	1.00	2520	2,520	NA	N/A
TPH GRO	4	0	N/A	ND	500	NA	N/A
TPH ORO	4	0	N/A	ND	3,148	NA	N/A
Total Metals							
Arsenic	6	5	1.91	5,940	3,106	9,200	N
Barium	6	6	1.86	231,000	124,100	725,000	N
Beryllium	2	2	1.18	611	519	800	N
Cadmium	6	3	2.69	1,210	450.5	<1,000	Y
Chromium	6	6	1.28	12,800	9,980	58,000	N
Copper	2	2	1.34	17,700	13,170	13,000	Y
Lead	8	8	1.66	14,000	8,420	21,800	N
Manganese	2	2	1.93	1,178,000	611,550	740,000	Y
Mercury	6	4	0.98	34	35	39	N
Nickel	2	2	1.55	20,100	12,960	14,000	Y
Selenium	6	3	2.74	6,610	2,412	260	Y
Silver	6	2	1.96	456	233	<700	N
Zinc	2	2	1.50	63,700	42,550	49,000	Y

Notes:
ug/kg - micrograms per kilogram
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 10-7
Groundwater Constituents of Concern Summary for Area 9: Gun Range
Boeing Tract 1, St. Louis, Missouri

Constituents of Concern	# of Samples	# of Detects	Ratio of Max Detected to Average Concentration	Concentration			
				Max Detected (ug/L)	Average (ug/L)	Maximum Concentration Limit (MCL) or Equivalent (ug/L)	Max Detected Exceeds MCL or Equivalent
Volatile Organic Compounds (VOCs)							
None	6	0	N/A	ND	N/A	N/A	N/A
Polynuclear Aromatic Hydrocabons (PAHs)							
None	1	0	N/A	ND	N/A	N/A	N/A
Total Petroleum Hydrocarbons (TPH)							
TPH DRO	3	2	2.09	253	121	NA	N/A
TPH GRO	3	2	N/A	ND	500	NA	N/A
TPH ORO	3	2	2.02	629	311	NA	N/A
Total Metals							
Arsenic	6	3	1.66	62	37.25	10	Y
Barium	6	4	1.17	520	445.25	2,000	N
Beryllium	2	1	1.00	2	2	4	N
Chromium	6	1	1.86	13	7	100	N
Copper	2	1	1.00	44	44	1,300	N
Lead	10	3	1.16	23	19.87	15	Y
Manganese	1	1	1.00	1,750	1,750	50	Y
Nickel	2	1	1.00	33	33	100	N
Silver	6	1	1.94	6.6	3.40	100	N
Zinc	2	1	1.00	229	229	2,000	N

Notes:
ug/L - micrograms per liter
DRO - Diesel range organic
GRO - Gasoline range organic
ORO - Oil range organic
NA: Not available
ND - Not detected
N/A - Not applicable
Max Detected - Maximum value of detected concentrations

Table 10-8(a)

Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Current On-site Non-residential Worker

Area 9: Gun Range, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc. (ug/kg)	Indoor Inhalation of Vapors from Subsurface Soil		Average GW Conc. (ug/L)	Indoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
		IELCR	HQ		IELCR	HQ		
Acetone	20	NA	2.24E-07	---	---	---	NA	2.24E-07
Methylene chloride	2.9	1.79E-11	3.54E-08	---	---	---	1.79E-11	3.54E-08
Naphthalene	2.6	NA	3.46E-11	---	---	---	NA	3.46E-11
Organics Total Risk		**1.79E-11**	**2.59E-07**		**NA**	**NA**	**1.79E-11**	**2.59E-07**
TPH-GRO	---	---	---	500	NA	3.04E-03	NA	3.04E-03
TPH-DRO	---	---	---	121	NA	2.39E-02	NA	2.39E-02
TPH-ORO	---	---	---	311	NA	1.63E-01	NA	1.63E-01
TPH Total Risk		**NA**	**NA**		**NA**	**1.90E-01**	**NA**	**1.90E-01**
Arsenic	---	---	---	37	NA	NA	NA	NA
Cadmium	513	NA	NA	---	---	---	NA	NA
Copper	17,700	NA	NA	---	---	---	NA	NA
Manganese	1,178,000	NA	NA	1,750	NA	NA	NA	NA
Nickel	20,100	NA	NA	---	---	---	NA	NA
Selenium	1,363	NA	NA	---	---	---	NA	NA
Zinc	63,700	NA	NA	---	---	---	NA	NA
Metals Total Risk		**NA**	**NA**		**NA**	**NA**	**NA**	**NA**
CUMULATIVE RISK		**1.79E-11**	**2.59E-07**		**NA**	**1.90E-01**	**1.79E-11**	**1.90E-01**

Notes:

NA: Not available

—: Risk evaluation was not performed.

HI: Hazard index

ug/kg: Micrograms per kilogram

ug/L: Micrograms per liter

GRO: Gasoline range organic

DRO: Diesel range organic

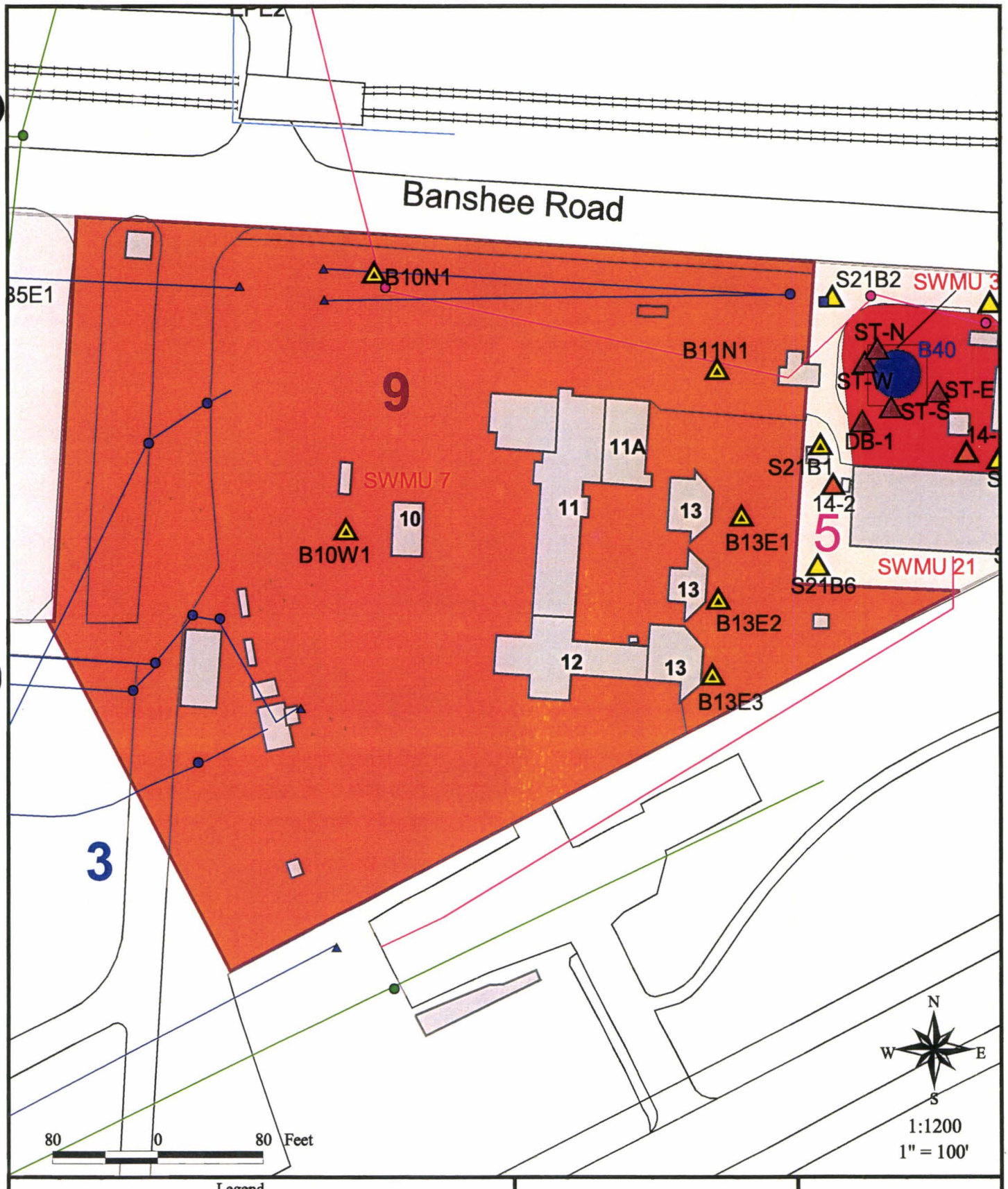
ORO: Oil range organic

TPH: Total petroleum organic

Table 10-8(b)
Calculation of Individual Excess Lifetime Cancer Risk (IELCR) and Hazard Quotient (HQ) for a Future Construction Worker
Area 9: Gun Range, Boeing Tract 1, St. Louis, Missouri

COCs	Average Soil Conc.	Dermal Contact with Soil		Accidental Ingestion of Soil		Outdoor Inhalation of Vapors and Particulates from Soil		Average GW Conc. (ug/L)	Dermal Contact with Groundwater		Outdoor Inhalation of Vapors from Groundwater		Sum of IELCR	Sum of HQ (HI)
	(ug/kg)	IELCR	HQ	IELCR	HQ	IELCR	HQ		IELCR	HQ	IELCR	HQ		
Acetone	17	NA	5.75E-08	NA	6.07E-08	NA	1.43E-07	---	---	---	---	---	NA	2.61E-07
Methylene chloride	6.5	2.41E-13	3.75E-08	2.68E-13	4.17E-08	4.02E-13	1.99E-08	---	---	---	---	---	9.11E-13	9.90E-08
Naphthalene	110	NA	6.38E-07	NA	5.96E-07	NA	1.12E-08	---	---	---	---	---	NA	1.25E-06
Toluene	4.4	NA	7.67E-10	NA	8.52E-09	NA	4.83E-08	---	---	---	---	---	NA	5.76E-08
Organics Total Risk		2.41E-13	7.34E-07	2.68E-13	7.07E-07	4.02E-13	2.22E-07		NA	NA	NA	NA	9.11E-13	1.66E-06
TPH-GRO	500	NA	NA	NA	2.27E-06	NA	2.95E-06	500	NA	NA	NA	2.70E-05	NA	3.22E-05
TPH-DRO	2,520	NA	5.56E-06	NA	1.69E-05	NA	4.84E-06	121	NA	NA	NA	2.11E-04	NA	2.38E-04
TPH-ORO	3,148	NA	8.02E-06	NA	2.06E-05	NA	6.50E-07	311	NA	NA	NA	1.44E-03	NA	1.46E-03
TPH Total Risk		NA	1.36E-05	NA	3.98E-05	NA	8.43E-06		NA	NA	NA	1.67E-03	NA	1.73E-03
Arsenic	---	---	---	---	---	---	---	37	NA	NA	NA	NA	NA	NA
Cadmium	451	NA	1.05E-05	NA	3.49E-04	2.48E-12	5.52E-08	---	---	---	---	---	2.48E-12	3.60E-04
Copper	13,170	NA	3.83E-06	NA	1.28E-04	NA	2.82E-06	---	---	---	---	---	NA	1.34E-04
Manganese	611,550	NA	1.52E-03	NA	1.69E-03	NA	2.68E-03	1,750	NA	NA	NA	NA	NA	5.89E-03
Nickel	12,960	NA	3.77E-07	NA	2.51E-05	9.53E-12	1.39E-05	---	---	---	---	---	9.53E-12	3.94E-05
Selenium	2,412	NA	5.61E-05	NA	1.87E-04	NA	5.17E-05	---	---	---	---	---	NA	2.95E-04
Zinc	42,550	NA	1.65E-06	NA	1.37E-05	NA	8.69E-09	---	---	---	---	---	NA	1.54E-05
Metals Total Risk		NA	1.60E-03	NA	2.40E-03	1.20E-11	2.74E-03		NA	NA	NA	NA	1.20E-11	6.73E-03
CUMULATIVE RISK		2.41E-13	1.61E-03	2.68E-13	2.44E-03	1.24E-11	2.75E-03		NA	NA	NA	1.67E-03	1.29E-11	8.47E-03

Notes:
NA: Not available
---: Risk evaluation was not performed.
HI: Hazard index
ug/kg: Micrograms per kilogram
ug/L: Micrograms per liter
GRO: Gasoline range organic
DRO: Diesel range organic
ORO: Oil range organic
TPH: Total petroleum organic



Legend

- RFI Shallow Boring
- RFI Shallow Boring/Temp. Piezometer
- RFA Boring
- RCRA Closure Shallow Boring
- Industrial Sewer Line
- Storm Sewer Line
- Sanitary Waste Line
- Manhole (Type by Color)
- UST
- SWMU

Drawn by: KLC Approved by:

Checked by: Date: December 19, 2003

Risk Assessment & Management Group, Inc.

Figure 10-1
Exposure Area 9:
Gun Range,
Boeing Tract 1 South

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ATTACHMENT 10-A

ECOLOGICAL RISK ASSESSMENT – AREA 9 GUN RANGE
TIER 1 SCREENING CHECKLIST FOR POTENTIAL RECEPTORS AND HABITAT
CHECKLIST #1

1. Is the site less than ½ mile to a surface water resource (pond, river, lake, etc.)?

   Yes, Area 9 is located above the portion of Coldwater Creek that flows through an enclosed culvert, and about 100 feet south of the portion of Coldwater Creek that enters an open culvert and continues to flow north.

2. Are wetlands (e.g. marshes, swamps, fens) on or adjacent to the site?

   No.

3. Are contaminated soils uncovered or otherwise accessible to ecological receptors and the elements?

   No, the site is partially paved and covered with buildings; and soil impacts are present at depths of 6 to 20 feet bgs.

4. Has a process (operational) discharge or storm water permit not been issued for the site?

   Site-wide, there is a storm water permit.

5. Is the site located in a known Karst environment (see Reference map)?

   No.

6. Are there federal or state rare, threatened, or endangered species on or within a ½ mile radius of the site? Note, the ½ mile radius limit does not necessarily apply to situations where a hydrogeological connection exists between the site and karsitic features.

   No.

7. Are there one or more environmentally sensitive areas (see Ecological Risk Assessment Figure #1 for definition) at or within a ½ mile radius of the site?

   No.

8. Are commercially or recreationally important species (fauna or flora) on or within a ½ mile radius of the site?

   No.

ATTACHMENT 10-B

ECOLOGICAL RISK ASSESSMENT – AREA 9 GUN RANGE
TIER 1 SCREENING CHECKLIST FOR POTENTIAL RECEPTORS AND HABITAT
CHECKLIST #2

1a. Can contaminants associated with the site leach, dissolve, or otherwise migrate to groundwater?

Yes, groundwater has been impacted.

1b. Are contaminants associated with the site mobile in groundwater?

Yes.

1c. Does groundwater from the site discharge into to ecological receptor habitat?

Yes, Coldwater Creek is located below the site in an enclosed culvert, and flows north into an open culvert about 100 feet north of Area 9.

1. Could contaminants associated with the site reach ecological receptors via groundwater?

No, groundwater impact is minimal, and located primarily about 75 feet from the portion of the creek that flows within an enclosed culvert, therefore impact is unlikely.

2a. Is NAPL present at the site?

No.

2b. Is NAPL migrating?

No.

2c. Could NAPL discharge occur where ecological receptors are found?

No.

2. Could contaminants from the site reach ecological receptors via migration of NAPL?

No.

3a. Are contaminants present in surface soils?

No.

3b. Can contaminants be leached from or be transported by erosion of surface soils?

No.

3. Could contaminants reach ecological receptors via erosional transport of contaminated soil or via precipitation runoff?

No.

4a. Are contaminants present in surface soil or on the surface of the ground?

No.

4b. Are potential ecological receptors on the site?

No.

4. Could contaminants reach ecological receptors via direct contact?

No.

5a. Are contaminants present on the site volatile?

Yes.

5b. Could contaminants on the site be transported in air as dust or particulate matter?

No, the site is partially paved, and the impact is not in the surficial soil.

5. Could contaminants reach ecological receptors via inhalation of volatilized contaminants or contaminants adhered to dust in ambient air or in subsurface burrows?

No, the site is partially paved, and the impact is not in the surficial soil.

6a. Are contaminants present in surface and shallow subsurface soils or on the surface of the ground?

Constituents at low levels have been detected in soils from depths of 6 to 20 feet bgs.

6b. Are contaminants found in soil on the site taken up by plants growing on the site?

No, the site is mostly paved and covered with buildings.

6c. Do potential ecological receptors on or near the site feed on plants found on the site?

No, the site is mostly paved and covered with buildings.

6d. Do contaminants found on the site bioaccumulate?

Yes, some metals.

6. Could contaminants reach ecological receptors via ingestion of either soil, plants, animals, or contaminants directly?

No.

7a. Are there Karsitic features on or within a ½ mile radius of the site?

No.

7b. Is there a hydrogeological connection between the site and karsitic features such as seeps, springs, streams, or other surface water bodies?

No.

7. Could contaminants reach ecological receptors via transport through a Karst system?

No.

Section
11.0

The Boeing Tract 1 Facility located in Hazelwood, St. Louis County, Missouri covers a total area of 228 acres. The Facility includes several buildings used to service and manufacture aircraft. The Facility included several USTs, ASTs, and other waste handling areas. Thirty-two SWMUs have been identified.

The risk assessment was performed for the following areas:

- Area 1 Runway Protection Zone
- Area 2 Demolished Area
  - Sub-area 2A
  - Sub-area 2B
  - Sub-area 2C
- Area 3 Retained Area
  - Sub-area 3A
  - Sub-area 3B
  - Sub-area 3C
  - Sub-area 3D
  - Sub-area 3E
  - Sub-area 3F
  - Sub-area 3G
  - Sub-area 3H
- Area 4 Power Plant
- Area 5 Industrial Water Treatment Plant
- Area 6 GKN Facility
  - Sub-area 6A
  - Sub-area 6B
  - Sub-area 6C
  - Sub-area 6D
- Area 7 Engineering Campus
- Area 8 Office Complex North
  - Sub-area 8A
  - Sub-area 8B
  - Sub-area 8C
- Area 9 Gun Range

The critical receptors, pathways, and complete routes of exposure are those shown below; however, not all Areas had these receptors:

Receptor	Pathways/Complete Routes of Exposure
Non-residential worker	Indoor inhalation of vapors from subsurface soil, and Indoor inhalation of vapors from groundwater.
Construction worker	Ingestion of soil, Dermal contact with soil, Outdoor inhalation of vapors and particulates from soil, Dermal contact with groundwater, and Outdoor inhalation of vapors from groundwater.

The COCs included VOCs, SVOCs including PAHs, PCBs, TPH, and metals. Using representative concentrations for each COC and average Area/Sub-area-specific data, risk was calculated using the models recommended in MDNR draft RBCA process document. This would be the equivalent of a Tier 2 evaluation. The cumulative risk for each receptor in each Area is summarized below:

Area	Non-residential Worker		Construction Worker	
	IELCR	HI	IELCR	HI
Area 1 (Max.)	N/A	N/A	6.34E-07	0.50
Sub-area 2A	5.97E-08	**22**	3.52E-07	0.31
Sub-area 2B	7.57E-06	**96**	1.89E-05	**3.1**
Sub-area 2C	2.02E-08	0.95	3.92E-08	0.047
Sub-area 3A	7.90E-08	**2.6**	4.52E-08	0.055
Sub-area 3B	3.35E-09	0.31	4.66E-10	0.0071
Sub-area 3C	2.00E-08	**77**	2.34E-08	**1.3**
Sub-area 3D	2.93E-08	0.075	1.17E-07	0.048
Sub-area 3E	4.31E-08	**10**	8.02E-10	0.12
Sub-area 3F	NA	0.86	NA	0.0082
Sub-area 3G	6.02E-08	**2.8**	9.38E-08	0.12
Sub-area 3H	NA	0.70	6.35E-13	0.0058
Area 4	2.17E-10	0.47	2.60E-06	0.014
Area 5	NA	0.00053	6.37E-08	0.013
Sub-area 6A	1.12E-10	0.054	5.33E-08	0.0089
Sub-area 6B	1.44E-06	**7.9**	2.44E-05	0.17
Sub-area 6C	7.03E-08	**4.1**	8.36E-08	0.060
Sub-area 6D	2.99E-10	0.00014	8.25E-08	0.013
Area 7	N/A	N/A	N/A	N/A

Area	Non-residential Worker		Construction Worker	
	IELCR	HI	IELCR	HI
Sub-area 8A	2.37E-08	0.00031	1.02E-07	0.020
Sub-area 8B	NA	**55**	3.74E-10	0.49
Sub-area 8C	NA	0.064	1.25E-12	0.0052
Area 9	1.79E-11	0.19	1.29E-11	0.008

Notes:
Number in bold exceeds the cumulative acceptable target levels.
IELCR: Individual excess lifetime cancer risk
HI: Hazard index
NA: Not available
N/A: Not applicable

Based on the above evaluation, the cumulative risk for the following areas exceeded the regulatory acceptable level of 1 x 10^{-4} for carcinogens and hazard index (HI) of 1 for non-carcinogens:

- Sub-area 2A,
- Sub-area 2B,
- Sub-area 3A
- Sub-area 3C,
- Sub-area 3E,
- Sub-area 3G
- Sub-area 6B,
- Sub-area 6C, and
- Sub-area 8B.

For Areas/Sub-areas where the cumulative risk or risk for each COC and all exposure pathways exceeded the target risk, the primary constituents and routes of exposure that caused the exceedence are identified below:

Area	COC	Exceedence Due to
Sub-area 2A	TPH-GRO	Indoor inhalation from groundwater by non-residential worker
	TPH-DRO	Indoor inhalation from groundwater by non-residential worker
Sub-area 2B	Aliphatics >nC12 to nC16	Indoor inhalation from groundwater by non-residential worker
	Aliphatics >nC16 to nC21	Indoor inhalation from groundwater by non-residential worker
	Aliphatics >nC21 to nC35	Indoor inhalation from groundwater by non-residential worker
	Tetrachloroethene	Dermal contact with groundwater by future construction worker

Area	COC	Exceedence Due to
Sub-area 3A	TPH-DRO	Indoor inhalation from groundwater by non-residential worker
Sub-area 3C	TPH-DRO	Indoor inhalation from groundwater by non-residential worker
	TPH-ORO	Indoor inhalation from groundwater by non-residential worker
	Total TPH	Outdoor inhalation of vapors from groundwater by construction worker
Sub-area 3E	Aliphatics >nC16 to nC21	Indoor inhalation from groundwater by non-residential worker
Sub-area 3G	Aliphatics >nC21 to nC35	Indoor inhalation from groundwater by non-residential worker
Sub-area 6B	Aliphatics >nC16 to nC21	Indoor inhalation from groundwater by non-residential worker
	Benzo(a)anthracene	Dermal contact with groundwater by construction worker
Sub-area 6C	Aliphatics >nC16 to nC21	Indoor inhalation from groundwater by non-residential worker
	Aliphatics >nC21 to nC35	Indoor inhalation from groundwater by non-residential worker
Sub-area 8B	Aliphatics >nC16 to nC21	Indoor inhalation from groundwater by non-residential worker
	Aliphatics >nC21 to nC35	Indoor inhalation from groundwater by non-residential worker

The risk evaluation was based on a non-residential current and future land use and non-domestic use of groundwater.

The risk evaluation also identified the absence of ecological risks at the site and that the groundwater was not a source of domestic water.

Sub-areas that exceed acceptable levels will be considered in the corrective measure study (CMS).

Area	COC	Exceedence Due to
Sub-area 3A	TPH-DRO	Indoor inhalation from groundwater by non-residential worker
Sub-area 3C	TPH-DRO	Indoor inhalation from groundwater by non-residential worker
	TPH-ORO	Indoor inhalation from groundwater by non-residential worker
	Total TPH	Outdoor inhalation of vapors from groundwater by construction worker
Sub-area 3E	Aliphatics >nC16 to nC21	Indoor inhalation from groundwater by non-residential worker
Sub-area 3G	Aliphatics >nC21 to nC35	Indoor inhalation from groundwater by non-residential worker
Sub-area 6B	Aliphatics >nC16 to nC21	Indoor inhalation from groundwater by non-residential worker
	Benzo(a)anthracene	Dermal contact with groundwater by construction worker
Sub-area 6C	Aliphatics >nC16 to nC21	Indoor inhalation from groundwater by non-residential worker
	Aliphatics >nC21 to nC35	Indoor inhalation from groundwater by non-residential worker
Sub-area 8B	Aliphatics >nC16 to nC21	Indoor inhalation from groundwater by non-residential worker
	Aliphatics >nC21 to nC35	Indoor inhalation from groundwater by non-residential worker

Based on the Missouri draft RBCA process document, these exceedences can be addressed by either active remediation which will require the development of target levels or by further evaluation using a Tier 3 site-specific approach. Further, an activity and use limitation that ensures future non-residential use of the facility and no groundwater use for domestic purposes, will be required.

The risk evaluation also identified the absence of ecological risks at the site and that the groundwater was not a source of domestic water.

Only Sub-areas that exceed acceptable levels will be considered in the corrective measure study (CMS).

Section
12.0

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