

DRAFT

Site-Specific Work Plan for the Passive Diffusion Bag Sampler Demonstration at Wurtsmith AFB, Michigan

Prepared For



**U.S. Department of the Army, Corps of Engineers,
Omaha District
Omaha, Nebraska**

**Contract 44650-99-D-005
Delivery Order DK01**



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September 2002

DRAFT

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PASSIVE DIFFUSION BAG SAMPLER DEMONSTRATION
AT WURTSMITH AFB, MICHIGAN**

September 2002

Prepared for:

**U.S. Army Corps of Engineers, Omaha District
and
Air Force Center for Environmental Excellence
Technology Transfer Division
and
Air Force Base Conversion Agency**

**CONTRACT NO. F44650-99-D-0005
Delivery Order DK01**

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APPENDICES

- Appendix A Health and Safety Plan Addendum
- Appendix B Historic Site Data
- Appendix C Sampling and Analysis Plan Field Procedures

LIST OF ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AFBCA	Air Force Base Conversion Agency
AFCEE/ERT	Air Force Center for Environmental Excellence, Technology Transfer Division
AS	air-sparging
BRAC	Base Realignment and Closure
CAS	Columbia Analytical Services, Inc.
cm/sec	centimeters per second
DCE	dichloroethene
DoD	Department of Defense
ft/day	feet per day
ft/ft	feet per foot
ft/mi	feet per mile
GAC	granular activated carbon
HASP	Health and Safety Plan
IDW	investigative-derived waste
JP-4	grade 4 jet propulsion fuel
MDEQ	Michigan Department of Environmental Quality
MNO	Monitoring Network Optimization
MWH	Montgomery Watson Harza Americas, Inc.
Parsons	Parsons Engineering Science, Inc.
PCE	tetrachloroethene
PDBS	passive diffusion bag sampler
PNA	polynuclear aromatic compound
PVC	polyvinyl chloride
QAPP	Quality Assurance Project Plan
RAO	Remedial Action-Operation
RL	reporting limit
RPD	relative percent difference
RPO	remedial process optimization
SAP	Sampling and Analysis Plan
SVOC	semivolatile organic compound
TCE	trichloroethene
USACE	US Department of the Army, Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geologic Survey
UST	underground storage tank
VOC	volatile organic compound
VC	vinyl chloride
WWII	World War II

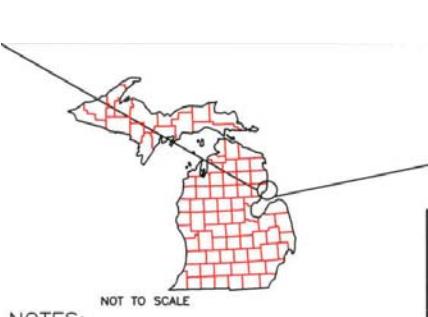
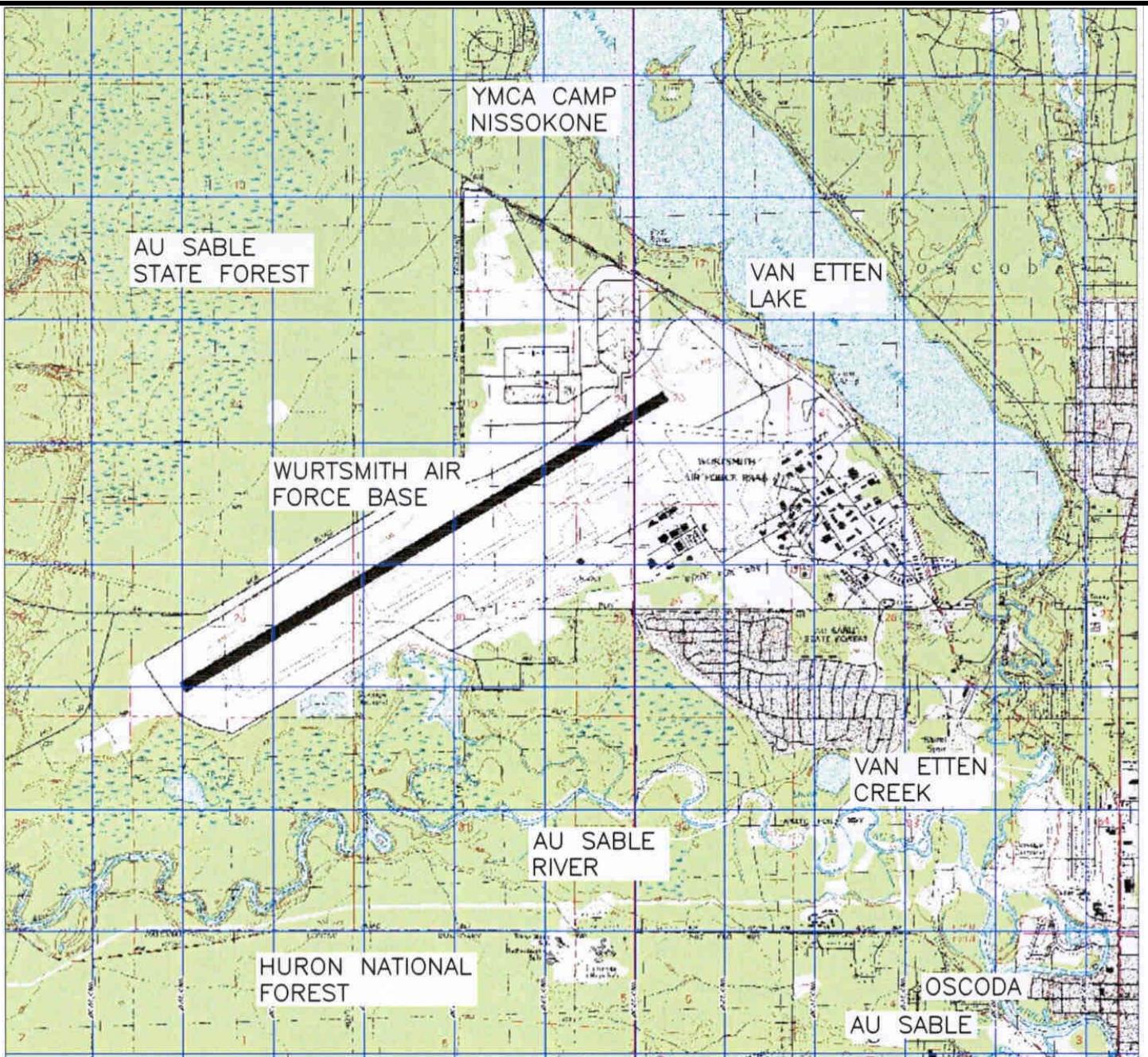
1.0 INTRODUCTION

1.1 Project Description and Location

On 22 January 2002, Parsons Engineering Science, Inc. (Parsons) was awarded delivery order DK01 under US Department of the Army, Corps of Engineers (USACE) Contract Number F44650-99-D-0005 to provide services, technical labor-hours, and materials to support Remedial Process Optimization (RPO) evaluations and demonstrate the effectiveness of Passive Diffusion Bag Samplers (PDBSs) for sampling volatile organic compounds (VOCs) in existing groundwater monitoring programs at selected Base Realignment and Closure (BRAC) sites administered by the Air Force Base Conversion Agency (AFBCA). The Technology Transfer Division of the Air Force Center for Environmental Excellence (AFCEE/ERT) has initiated the PDBS demonstration to introduce this technology to multiple Department of Defense (DoD) installations and to improve the cost effectiveness of groundwater monitoring programs for VOCs.

This site-specific work plan is for the demonstration of the PDBS technology at Wurtsmith Air Force Base (AFB), Michigan (Figure 1.1). The proposed project locations for this demonstration will include sites LF-30/31, SS-08, and SS-57 (Figure 1.2). Site LF 30/31 (Northern Landfills) is located on the north side of Wurtsmith AFB, site SS-08 (trichloroethene [TCE] and Fuel Spill, SAC Nose Doc and Operational Apron [ACC Apron]) is located toward the northeast portion of the runway, and site SS-57 (Old Apron Hydrant Fuel System) is located adjacent to and east of site SS-08.

Diffusion sampling is a relatively new technology designed to utilize passive sampling techniques that eliminate the need for well purging. Specifically, a diffusive-membrane capsule is filled with deionized/distilled water, sealed, suspended in a well-installation device, and lowered to a specified depth below the water level in a monitoring well. Over time (no less than 72 hours), VOCs in groundwater diffuse across the membrane, and the water inside the sampler reaches equilibrium with groundwater in the surrounding



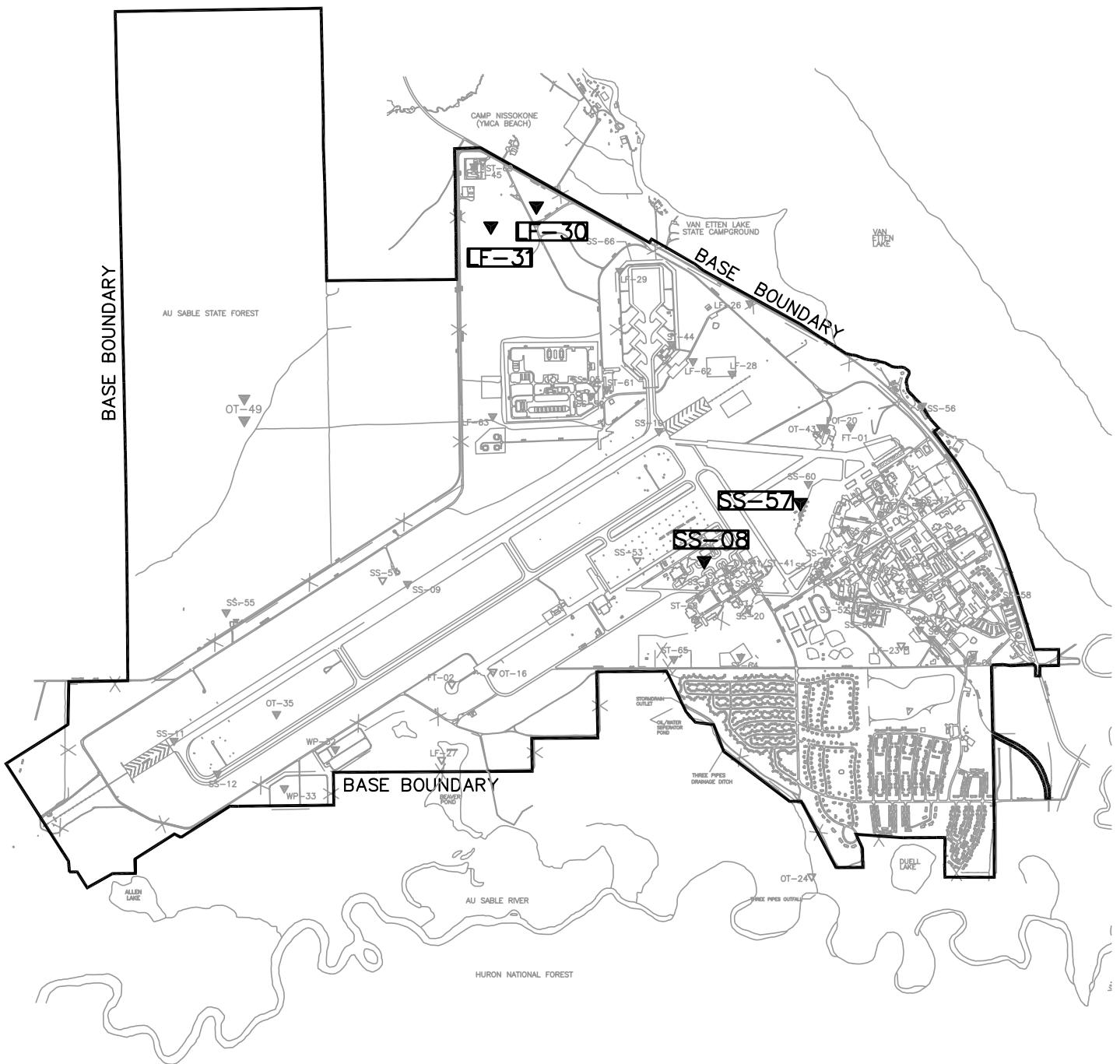
NOTES:

SITE LOCATION MAP DEVELOPED FROM THE FOLLOWING U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE MAPS: FOOT SITE VILLAGE, MICHIGAN, DATED 1989 AND OSCODA, MICHIGAN; DATED 1989 DELORME 3-D TOPOQUADS, 1999.

FIGURE 1.1
BASE LOCATION MAP
WURTSMITH AFB

Passive Diffusion Bag Sampler Demonstration
Wurtsmith AFB, Michigan

PARSONS
Denver, Colorado



LEGEND:

- ▼ LF-31 IRP SITE LF-31
- ▼ LF-30 IRP SITE LF-30
- ▼ SS-57 IRP SITE SS-57
- ▼ SS-08 IRP SITE SS-08



0 1500 3000
SCALE: 1"=3000'

FIGURE 1.2

SITE LOCATION MAP
WURTSMITH AFB

Passive Diffusion Bag Sampler Demonstration
Wurtsmith AFB, Michigan

PARSONS

Denver, Colorado

formation. The sampler is subsequently removed from the well and the water in the diffusion sampler is transferred to a sample container and submitted for laboratory analysis of VOCs. Benefits of diffusion sampling include reduced sampling costs and reduced generation of investigation-derived waste (IDW).

1.2 Objectives

The PDBS demonstration at Wurtsmith AFB has three primary objectives:

- Develop a vertical profile of VOC concentrations across the screened interval at each sampled location;
- Statistically compare groundwater analytical results for VOCs obtained using the current (conventional) sampling method (i.e., micropurge sampling method) with results obtained using the PDB sampling method. VOC results from the scheduled October/November 2002 Basewide Remedial Action - Operation (RAO) groundwater monitoring program will be compared to the results obtained using the PDBS method; and
- Compare the costs of PDB and conventional sampling.

Vertical contaminant profiles will be developed by placing PDBSs at discrete depths within the saturated screened interval of select monitoring wells, and analyzing for VOCs at each interval. The resulting information will aid the Base in evaluating contaminant migration and fate in the saturated zone, and will allow optimization of the Basewide RAO groundwater monitoring program. The statistical comparison of the conventional and PDB sampling results will be used to assess whether PDB sampling for VOCs is an efficient and appropriate sampling method at Wurtsmith AFB.

A secondary objective of this project is to perform a monitoring network optimization (MNO) at Wurtsmith AFB using a three-tiered optimization approach. This approach consists of a qualitative evaluation, an evaluation of temporal trends in contaminant concentrations, and a spatial statistical analysis. The evaluation assesses the frequency of monitoring, as well as the number and location of wells in the monitoring network to

determine an efficient and effective monitoring network for the site. Ultimately, recommendations are developed to optimize the groundwater monitoring program.

1.3 Scope

The PDBS demonstration at Wurtsmith AFB will require two mobilizations - one to place the diffusion samplers in the selected monitoring wells, and a second to retrieve the samplers from the wells. The PDBSs will be installed in early October 2002 to provide adequate equilibration time before the base executes its October/November 2002 RAO groundwater sampling event. To the extent feasible, the PDBSs will be retrieved immediately prior to the conventional October/November 2002 RAO groundwater sampling event at the selected locations to ensure temporal comparability of the analytical results obtained using the two methods. The PDBSs will be in place for a minimum of 14 days, which fulfills the 14-day minimum equilibration time period specified in the *Draft Work Plan for the Air Force Base Conversion Agency Passive Diffusion Bag Sampler Demonstration* (Parsons, 2002a).

For the MNO, locations and completion intervals of individual monitoring wells and sampling points will be examined, and the informational contribution of each well or sampling point to the network will be weighed against the cost of monitoring at that point. Monitoring protocols and analytical methods also will be evaluated. Where warranted, recommendations will be developed for optimization of the portion of the monitoring network that is evaluated. Methods to be used in the evaluation will include, but are not limited to, qualitative hydrogeologic and hydrochemical analyses, application of statistical optimization techniques, and application of decision-logic structures. A maximum of 30 monitoring wells at this installation will be evaluated as part of this task. During the June 27, 2002 kickoff meeting at Wurtsmith AFB, sites LF-30/31 and OT-24 were chosen as candidate sites for the MNO evaluation. The results of the evaluation will be included in the Site-Specific Diffusion Sampler Demonstration Report for Wurtsmith AFB.

1.4 Document Organization

This work plan is organized into seven sections, including this introduction, and three appendices. The site description is presented in Section 2. Section 3 presents the scope of the PDBS investigation at Wurtsmith AFB. Project organization, schedule, and an overview of the PDBS site-specific results report are summarized in Sections 4, 5, and 6, respectively. References used in the preparation of this work plan are presented in Section 7. Appendix A provides a site-specific addendum to the Program Health and Safety Plan (HASP) (Parsons, 2002b). Historic site-specific groundwater quality data for Wurtsmith AFB is provided in Appendix B. Appendix C presents selected groundwater sampling procedures from the *Quality Assurance Project Plan (QAPP) and Sampling Analysis Plan (SAP) for Basewide Remedial Action-Operation for Wurtsmith AFB, Oscoda, Michigan* (Montgomery Watson Harza Americas, Inc. [MWH], 2002).

2.0 SITE DESCRIPTION

2.1 Location and Description of Wurtsmith AFB

Wurtsmith AFB is located approximately 2 miles west of Oscoda, Michigan, within Iosco County (Figure 1.1). The Base occupies 4,626 acres, is bound on the north by Van Etten Lake, on the south by the Au Sable River and the Huron National Forest, on the east and the southeast by the cities of Oscoda and Au Sable, respectively, and on the west by the Alpena State Forest.

Wurtsmith AFB was formerly established and operated as Oscoda Air Field in the early 1920s as an aerial gunnery range, providing opportunities to acquaint flyers from Selfridge Air Force Base. In 1953 the name Wurtsmith was officially recognized, and in 1955 the base became a permanent Air Force installation. Wurtsmith AFB was home to the KC-135 and B-52G aircraft under the 379th Bombardment Wing.

Wurtsmith AFB was selected for closure under the Defense Base Closure and Realignment Act of 1991 and was officially closed on June 30, 1993. The Base is currently undergoing site restoration activities pursuant to property transfer.

2.2 Geology and Hydrogeology

The geology of the area consists of unconsolidated glacial deposits and underlying bedrock. The bedrock is composed predominantly of clastic sedimentary rocks over 300 million years old. The unconsolidated sediments are the result of continental glaciation that ended approximately 13 thousand years ago (URS, 2000).

Bedrock beneath Wurtsmith AFB consists of Mississippian sandstone and shale formations which have a structural dip to the southwest into the Michigan Basin (Figure 2.1). The topographic surface of the bedrock dips to the east as a result of glacial erosion during the Pleistocene Epoch. Depth to bedrock can vary from 100 to 250 feet across the base due to this unconformity. Unconsolidated sediments deposited during glaciation episodes of the Pleistocene Epoch overlie the bedrock beneath Wurtsmith AFB. Glacial till and other ice-contact sediments consisting of clay rich sand, gravel, and silt were deposited directly on the bedrock erosional surface (United States Geologic Survey [USGS], 1990).

Locally, silty-sand and gravel deposits are found beneath the glacial till. As the glacier retreated, meltwater flooded the study area resulting in the formation of the ancestral Great Lakes and their associated lacustrine sediments. Silt- and clay-sized particles settled out of the lakes to form the extensive silty-clay layer that exists at a depth of 30 to 80 feet beneath the surface. The silty-clay layer is believed to be between 100 and 250 feet thick (USGS, 1990).

Table 2.1 presents a summary of the various hydrogeologic units beneath the Base and their associated geologic units. The silty-clay aquitard beneath the unconsolidated sediments of the water table aquifer retards downward migration of the contaminated groundwater plumes that exist on Wurtsmith AFB. Hydrogeologic units below the silty-clay aquitard have been found to be undesirable as a public water supply because of the high dissolved solids or high chloride concentrations (Cummings and Twenter, 1986).

FIGURE 2.1
GEOLOGICAL CROSS-SECTION A-A'
PASSIVE DIFFUSION BAG SAMPLER DEMONSTRATION
WURTSMITH AFB, MICHIGAN

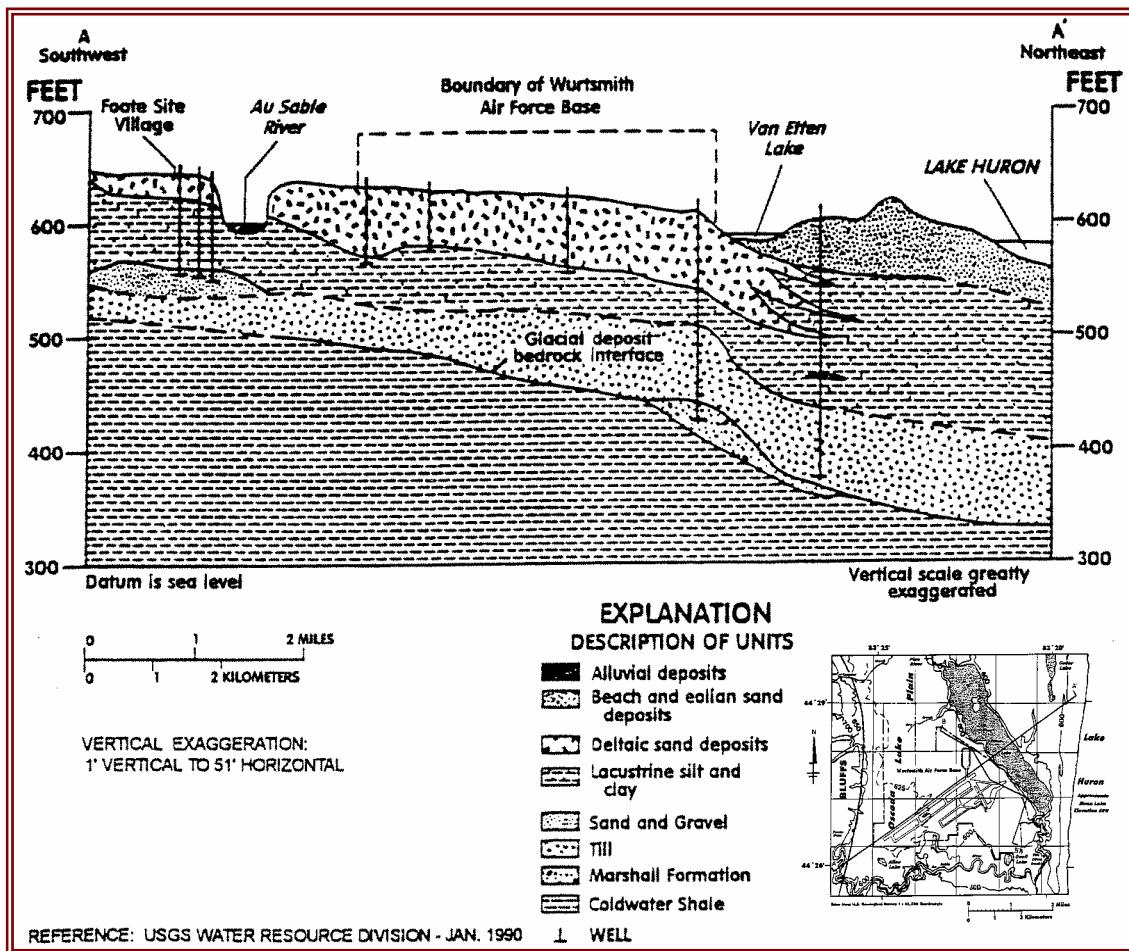


TABLE 2.1
GEOLOGIC AND HYDROGEOLOGIC UNITS
PASSIVE DIFFUSION BAG SAMPLER DEMONSTRATION
WURTSMITH AFB, MICHIGAN

ERA	PERIOD	EPOCH	GEOLOGIC UNIT	LITHOLOGY	HYDROGEOLOGIC UNIT
C E N O Z O I C	Q u a t e r n a r y	Holocene	Eolian deposits	Sand	Sand and gravel water table aquifer
			Beach deposits	Sand and gravel	
			Alluvium	Gravel, sand and silt	
		Pleistocene	Lacustrine (deltaic)	Sand and gravel	30-80 feet
			Lacustrine (clay)	Clay and silt	
			Glacial Till	Sand, gravel, silt and clay	
Paleozoic	Mississippian	Osage	Marshall Formation	Sandstone	Sandstone aquifer 0-50 feet
		Kinderhook	Coldwater Shale	Shale	Shale aquitard >500 feet

Modified from USGS, 1990

*Note: Shaded area highlights the two major hydrogeologic units, the unconsolidated water table aquifer and the silty-clay layer, and their associated geologic and lithologic units.

The sand and gravel water table aquifer is present across the entire base, with an average thickness of approximately 65 feet and an average saturated thickness of 45 feet. This aquifer was the principal water supply source for Wurtsmith AFB. The aquifer consists of brown to gray, medium- to coarse-grained sand containing some gravel lenses. Grain size sieve analyses have shown that, in approximately 80 percent of the samples, the average grain size is in the medium grain range, 0.25 to 0.5 millimeters (Stark, et al., 1983). Most of the soils are moderately well sorted.

The sand and gravel water table aquifer is underlain by a thick confining layer of silty-clay. The silty-clay aquitard is composed of silt and clay in the upper part, but contains some clay-rich sand and gravel (glacial till) in the lower part. The aquitard can be at least 125 feet thick in areas east and north of Van Etten Lake, and locally as thick as 250 feet. Only one well on base (GST-3) has penetrated the entire silty-clay aquitard, and it was found that the clay was 95 feet thick (Cummings and Twenter, 1986). The silty-clay aquitard effectively isolates the sand and gravel water table aquifer and restricts vertical migration of groundwater between the sand and gravel aquifer and the hydrogeologic units below (USGS, 1990).

Groundwater table elevations fluctuate from one to three feet annually with a low in February and a high in May, depending on precipitation (USGS, 1990). A groundwater divide runs diagonally across the Base from northwest to southeast. South of the divide, groundwater flows toward the Au Sable River, and north of the divide, toward Van Etten Creek and Van Etten Lake. The regional groundwater flow regime is not significantly altered by Base extraction and supply pumping wells.

2.2.1 Historical Groundwater Flow

The horizontal hydraulic gradient of the groundwater table ranges from less than 10 to about 25 feet per mile (ft/mi) or 1.9×10^{-3} to 4.7×10^{-3} feet per foot (ft/ft) across the Base. In the bluff area west of the Base, gradients are as great as 50 ft/mi or 9.5×10^{-3} ft/ft. Hydraulic conductivity, K, ranges from 75 to 310 feet per day (ft/day) (2.7×10^{-2} to 1.1×10^{-1} centimeters per second [cm/sec]) (Cummings and Twenter, 1986).

2.3 Nature and Extent of Contamination

2.3.1 LF-30/LF-31 Northern Landfills

From 1960 to 1973, LF-30, an approximate 27-acre landfill bounded on the northeast by the northern AFB boundary and Perimeter Road, received domestic and industrial waste which included drums of solvents. In 1971, two 6,000-gallon tank trailers were buried at the landfill and were used as temporary storage underground storage tanks (USTs) for grade 4 jet propulsion fuel (JP-4), oils, solvents, thinners, and lubricants. The

tank trailers were excavated in 1979. In 1973, LF-30 was closed and capped with a pervious fill material and seeded in accordance with regulations existing during that period. In 2001, a remediation system consisting of a groundwater, granular activated carbon (GAC) treatment system and an air-sparging (AS) system was installed along the northern boundary of LF-30 to treat groundwater contamination and prevent further migration of contamination off-site (MWH, 2002).

From 1973 to 1979, LF-31, an approximate 74-acre landfill located south-southeast of IRP Site ST-45 DRMO, received municipal and industrial wastes. Approximately 18 acres of the landfill were used for disposal of municipal waste from the AFB and associated housing. The remainder of the landfill received only demolition debris such as concrete rubble, asphalt, and lumber. Sources indicate that some paint cans and metals also may have been dumped. In October 1979, LF-31 was closed for non-compliance with the Michigan Solid Waste Management Act of 1978, due to its location in permeable soil. The portion of LF-31 that had been receiving municipal/sanitary waste was capped in 1981 using sand and a polyvinyl chloride (PVC) geo-membrane (MWH, 2002).

The primary groundwater contaminants for these landfills have been identified as benzene, cis-1,2-dichloroethene (DCE), ethylbenzene, methylene chloride, TCE, vinyl chloride (VC), and xylenes (MWH, 2002).

2.3.2 SS-08 TCE and Fuel Spill, SAC Nose Doc and Operational Apron (ACC Apron)

Past operations at this site included aircraft parking, cleaning, maintenance, and fueling. No major spills were reported to have occurred in this area. Site investigations conducted in this area in 1994 and 1995 indicated dissolved phase VOCs in the groundwater. The primary groundwater contaminants at this site have been identified as benzene, methylene chloride, tetrachloroethene (PCE), and TCE (MWH, 2002).

2.3.3 SS-57 Old Apron Hydrant Fuel System

The World War II (WWII) vintage, refueling hydrant system that underlies the Base Operations Apron was abandoned in 1972. The UST at the site continued to be used until Base closure in 1993. Spills and leaks from the aircraft fueling/hydrant system are believed to have impacted soil and groundwater with jet fuel constituents. The hydrant refueling system was decommissioned in 1995. This task included the decommissioning/removal of the hydrant system piping, demolition of Building 5081, the removal of two 50,000 gallon and one 12,000 gallon USTs, and the removal of six apron hydrants. Elevated concentrations of VOCs, semivolatile polynuclear aromatic compounds (PNAs), and lead were detected in soil samples collected along the hydrant system piping and throughout the floor of the UST excavations. A Remedial Investigation by Versar, Inc. in 1998 indicated VOCs and semivolatile organic compounds (SVOCs) in soil and groundwater at concentrations greater than the Michigan Department of Environmental Quality (MDEQ) generic industrial criteria.

3.0 SCOPE OF PDBS DEMONSTRATION

An estimated total of 33 samples will be collected from 19 monitoring wells located within the three selected sites (LF-30/31, SS-08, and SS-57) on and immediately adjacent to Wurtsmith AFB property as part of this project. The 19 monitoring wells have been chosen because they 1) are located on or adjacent to the AFB property, 2) are sampled for VOCs and have historically had groundwater with detectable concentrations of VOCs, and 3) are included in the Basewide RAO groundwater monitoring program scheduled for October/November 2002. The monitoring wells that will be sampled during this PDBS demonstration are summarized in Table 3.1, and their locations are shown on Figures 3.1, 3.2, and 3.3.

3.1 Field Activities

The PDBSs will be installed and retrieved in general accordance with the passive diffusion bag sampler installation and recovery standard operating procedures presented in Appendix B of the *Draft Work Plan for the Air Force Base Conversion Agency, Passive Diffusion Bag Sampler Demonstration* (Parsons, 2002a). PDBSs will be installed

TABLE 3.1
SAMPLING LOCATION SUMMARY
PASSIVE DIFFUSION BAG SAMPLER DEMONSTRATION
WURTSMITH AFB, MICHIGAN

Site	Well ID	Total Depth (ft btoc) ^{a/}	Well Diameter (inches)	Screened Interval (ft btoc)		Screen Length (feet)	Top of Casing Elevation (ft amsl) ^{b/}	Depth to Groundwater April/July 2002 (ft btoc)	Estimated Number of PDBSs ^{c/}	Concentrations of COC ^{d/} ($\mu\text{g}/\text{L}$) ^{e/} April 2002 (unless otherwise noted)
LF-30/31	H127D	47.15	4	47.15	-	43.15	4	620.46	18.26	1 TCE - 135
LF-30/31	H127S	31.48	4	31.48	-	27.48	4	620.32	18.02	1 TCE - 531, DCE - 77
LF-30/31	H75S	28.34	4	28.34	-	24.34	4	608.03	14.79	1 TCE - 21, DCE - 13
LF-30/31	H78D	54.01	4	54.01	-	50.01	4	618.86	24.23	1 VC - 6
LF-30/31	H78S	36.15	4	36.15	-	32.15	4	618.83	24.24	1 Benzene - 121
LF-30/31	LF30-MW4	27.64	2	27.64	-	17.64	10	616.80	18.37	3 Benzene - 6
LF-30/31	LF30-MW5	25.69	2	25.69	-	15.69	10	606.36	15.43	3 TCE - 10, DCE - 30
LF-30/31	Y3	22.96	2	22.96	-	12.96	10	607.18	15.48	2 Benzene - 225
LF-30/31	Y4	23.40	2	23.40	-	13.40	10	606.03	14.77	3 Benzene - 228
SS08	H89S	23.30	4	23.30	-	13.30	10	621.45	17.70	2 all non-detects
SS08	H90S	23.44	4	23.44	-	13.44	10	621.42	17.90	2 Naphthalene - 71
SS57	A48	24.07	4	24.07	-	20.07	4	616.80	21.36	1 Naphthalene - 84
SS57	H83D	45.87	4	45.87	-	41.87	4	616.62	23.74	1 TCE - 1 (6/25/01)
SS57	H83S	35.43	4	35.43	-	31.43	4	616.62	23.73	1 Isopropyl Benzene - 1
SS57	SS57-MW2I	45.00	2	45.00	-	40.00	5	613.67	20.60	2 TCE - 1
SS57	SS57-MW3D	67.00	2	67.00	-	62.00	5	616.75	23.97	2 m,p-Xylenes - 13 (6/25/01)
SS57	SS57-MW3S	26.00	2	26.00	-	16.00	10	616.79	24.03	3 Benzene - 219, BTEX - 3,500, Naphthalene - 132
SS57	SS57-MW4S	25.00	2	25.00	-	15.00	10	615.41	20.91	1 Benzene - 188, BTEX - 4,400, Naphthalene - 186
SS57	R5S	34.02	4	34.02	-	29.02	5	615.15	24.62	2 Benzene - 56, BTEX - 807, Naphthalene - 20
Total	19 Wells								33 PDBSs	

^{a/} ft btoc = feet below top of casing.

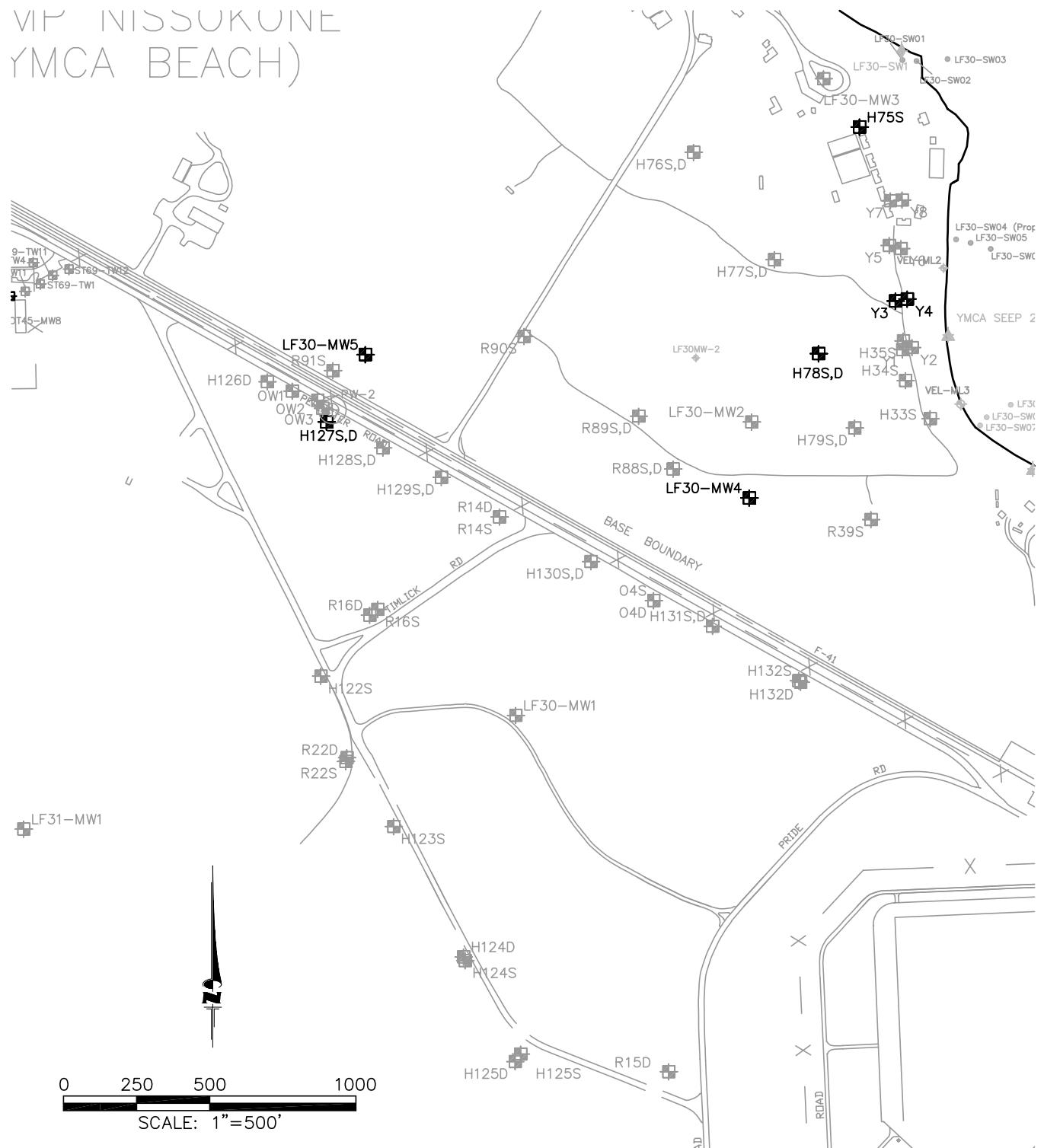
^{b/} ft amsl = feet above mean sea level.

^{c/} PDBS = passive diffusion bag sampler.

^{d/} COC = chemicals of concern; TCE = trichloroethene, DCE = dichloroethene, VC = vinyl chloride, BTEX = benzene, toluene, ethylbenzene, and xylenes.

^{e/} $\mu\text{g}/\text{L}$ = micrograms per liter.

VIP NISSUKUNE
YMCA BEACH)



LEGEND:

- MONITORING WELL LOCATION SELECTED FOR PDBS DEMONSTRATION
- MONITORING WELL LOCATION (NOT TO BE SAMPLED WITH PDBS)
- SURFACE WATER SAMPLING LOCATION (NOT TO BE SAMPLED WITH PDBS)
- SEEP SAMPLING LOCATION (NOT TO BE SAMPLED WITH PDBS)

FIGURE 3.1
SITE LF-30/31
PDBS DEMONSTRATION
LOCATIONS
 Passive Diffusion Bag Sampler Demonstration
 Wurtsmith AFB, Michigan
PARSONS
 Denver, Colorado

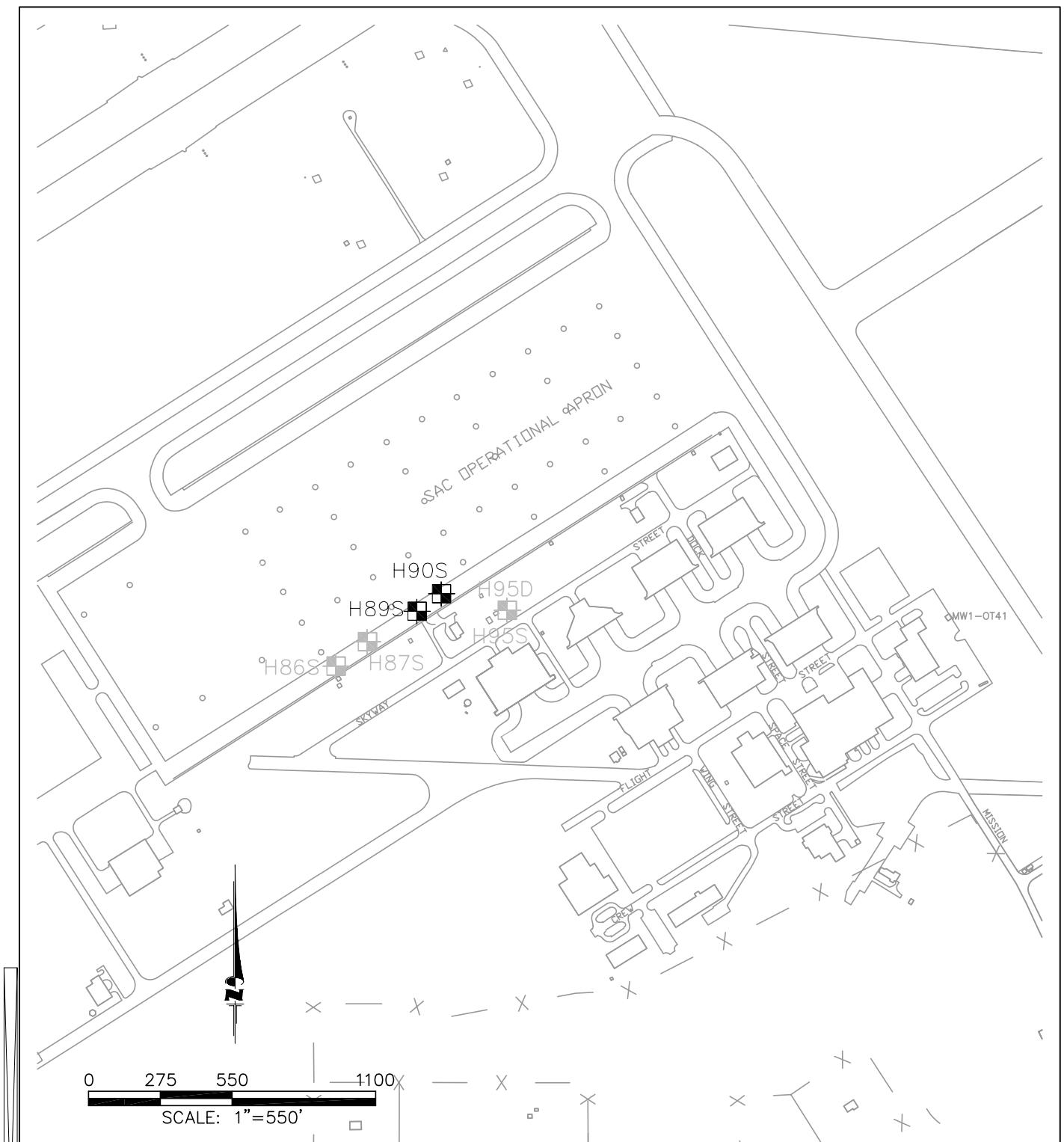
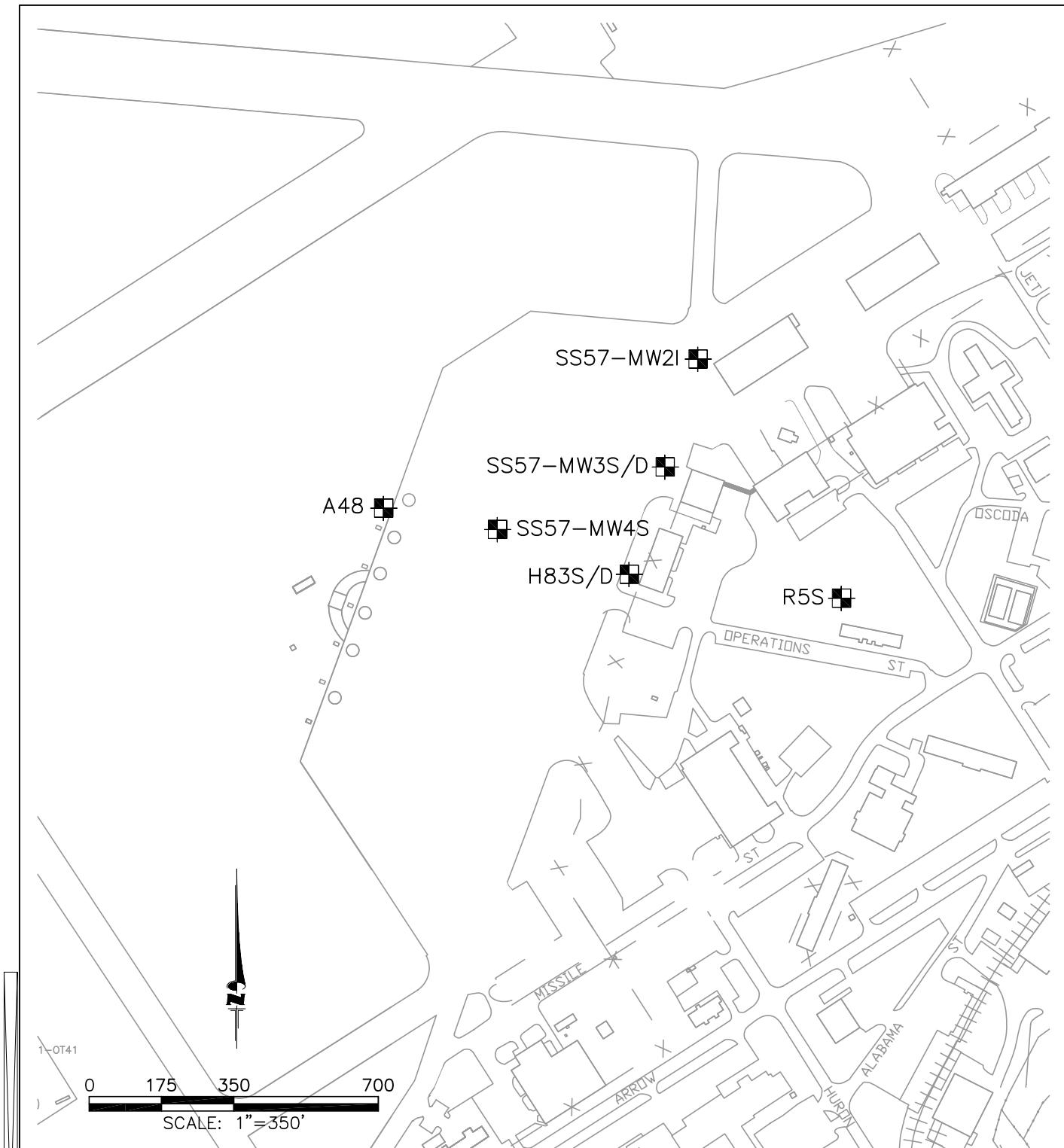


FIGURE 3.2
SITE SS-08
PDBS DEMONSTRATION
LOCATIONS

Passive Diffusion Bag Sampler Demonstration
Wurtsmith AFB, Michigan

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Denver, Colorado



LEGEND:

- MONITORING WELL LOCATION
SELECTED FOR PDBS DEMONSTRATION

FIGURE 3.3
SITE SS-57
PDBS DEMONSTRATION
LOCATIONS

Passive Diffusion Bag Sampler Demonstration
Wurtsmith AFB, Michigan

PARSONS
Denver, Colorado

throughout the screened interval of each well (i.e., 1 PDBS per 3 feet of saturated screen rounded to the nearest whole number) to obtain a vertical profile of contaminant concentrations. The PDBSs will be collected just prior to the October/November 2002 RAO conventional groundwater sampling event (to be conducted by MWH).

Sample aliquots from PDBSs installed in the 19 wells will be shipped to Columbia Analytical Services, Inc. (CAS) in Redding, California for VOC analysis using US Environmental Protection Agency (USEPA) Method 8260B. This is the same laboratory and analytical method that will be used by MWH for their conventional sampling of the same wells. The analyses will be performed in accordance with the *Quality Assurance Project Plan and Sampling Analysis Plan for Basewide Remedial Action-Operation for Wurtsmith AFB, Oscoda, Michigan* (MWH, 2002). Field quality control samples will be collected at the following frequencies:

- 10 percent field duplicates,
- 5 percent matrix spikes and matrix spike duplicates,
- 1 pre-installation equipment rinseate,
- 1 pre-installation source water blank, and
- Approximately 4 trip blanks (1 per cooler of samples).

The *Quality Assurance Project Plan and Sampling Analysis Plan for Basewide Remedial Action-Operation for Wurtsmith AFB, Oscoda, Michigan* (MWH, 2002) will be adopted as the site-specific SAP for the PDBS demonstration where appropriate. Sampling procedures for equipment decontamination, waste handling, and water level measurements from this SAP are presented in Appendix C of this work plan. The PDBS-specific methods and procedures outlined in the *Draft Work Plan for the Air Force Base Conversion Agency, Passive Diffusion Bag Sampler Demonstration* (Parsons, 2002a) will be adhered to during all PDBS-related activities at Wurtsmith AFB.

3.2 Analytical Results Comparison/Evaluation

Analytical results for groundwater samples collected using the PDBS and conventional techniques will be compared, and the results will be evaluated. Typically, if maximum concentrations from the PDBSs are higher than concentrations in samples collected using the conventional method, it is probable that the PDBS concentrations are more representative of ambient groundwater chemistry conditions than the conventional-sampling data (Vroblesky, 2001). Considering this guidance, if the maximum analytical result obtained using PDB sampling is greater than or equal to the conventional sampling result, it will indicate that the PDBS method is appropriate for use in that particular well. If however, the conventional method produces VOC results that are higher, by a predetermined amount (discussed later in this section), than the concentrations reported for the PDBSs, then the PDBS method may not adequately represent local ambient groundwater conditions. In this case, the difference may be due to a variety of factors, including hydraulic and chemical heterogeneity within the saturated screened interval of the well, vertical flow of groundwater within the well, and/or the relative permeability of the well screen with respect to the surrounding aquifer matrix (Vroblesky, 2001).

Analytical results for all samples collected using the PDB samplers will be compared to results from the conventional sampling using relative-percent-difference (RPD), as defined by the following equation:

$$RPD = 100 \cdot [\text{abs}(D-C)]/[(D+C)/2]$$

Where:

abs = absolute value

D = diffusion sampler result

C = conventional sample result.

Therefore, multiple RPD values may be computed for each well, despite the fact that there is only one conventional sampling result. Each RPD value will be compared to the acceptance criteria to determine whether it is within the acceptable range.

For this investigation, an RPD of less than 30 will be considered to demonstrate good correlation between sample results. In summary, the PDBS acceptance criteria that will be used are:

- If at least one PDBS result for a given well is equal to or greater than the conventional sampling result, PDBS will be deemed appropriate for use in that well.
- If either the PDBS or the conventional sample result is greater than three times the laboratory reporting limit (RL), and the PDBS result is less than the conventional result, an RPD of 30 will be used as the acceptance criterion.
- If both the PDBS and conventional sample results are less than three times the laboratory RL, a value of \pm the lowest RL will be used as the range of acceptance between the two values.

4.0 PROJECT ORGANIZATION

Addresses and telephone numbers of the Wurtsmith PDBS project team are as follows:

Name	Title	Address	Phone/Email	Fax
Mark Mercier	USACE Project Manager	USACE, Omaha District CENWO-PM-HC 106 So. 15 th St. Omaha, NE 68102	(402) 221-7664 email: mark.a.mercier@usace.army.mil	(402) 221-7796
Rafael Vazquez	AFCEE POC	AFCEE/ERT 3207 Sidney Brooks Brooks AFB, TX 78235-5344	(210) 536-1431 email: rafael.vazquez@brooks.af.mil	(210) 536-4330
David Becker	USACE POC	USACE CENWO-HXG 12565 West Center Road Omaha, NE 68144	(402) 697-2655 email: dave.becker@usace.army.mil	(402) 697-2595
Ed Bishop	Parsons Program Manager	Parsons 10521 Rosehaven Street; Two Flint Hill Fairfax VA 22030	(703) 591-7575 email: edward.bishop@parsons.com	(703) 591-1305
Eileen Buckley	Parsons Program Administrator	Parsons 10521 Rosehaven Street; Two Flint Hill Fairfax VA 22030	(703) 591-7575 email: eileen.buckley@parsons.com	(703) 591-1305

Name	Title	Address	Phone/Email	Fax
Peter Guest	Parsons Project Manager	Parsons 1700 Broadway, Suite 900 Denver, Colorado 80290	(303) 831-8100 email: peter.guest@parsons.com	(303) 831-8208
Doug Downey	Parsons Technical Director for PDBS	Parsons 1700 Broadway, Suite 900 Denver, Colorado 80290	(303) 764-1915 email: doug.downey@parsons.com	(303) 831-8208
John Hicks	Parsons PDBS Task Manager	Parsons 1700 Broadway, Suite 900 Denver, Colorado 80290	(303) 764-1941 email: john.hicks@parsons.com	(303) 831-8208
John Tunks	Parsons PDBS Deputy Task Manager	Parsons 1700 Broadway, Suite 900 Denver, Colorado 80290	(303) 764-8740 email: john.tunks@parsons.com	(303) 831-8208
Tom Dragoo	Parsons PDBS Site Manager for Wurtsmith AFB	Parsons 1700 Broadway, Suite 900 Denver, Colorado 80290	(303) 764-1953 email: tom.e.dragoo@parsons.com	(303) 831-8208
Paul Rekowski	AFBCA/DB, Wurtsmith	AFBCA/DB Wurtsmith 3950 E. Arrow Oscoda, Mi 48750	(989)-739-5161 email: prekowski@afbdal.hq.af.mil	(989)-739-2930
Tom Barzyk	MWH Project Manager	MWH 41551 Eleven Mile Road Novi, Michigan 48375	(248) 449-3402 email: thomas.e.barzyk@mwhglobal.com	(248) 344-0217
Tiffany Yusko	MWH Support Staff	MWH 41551 Eleven Mile Road Novi, Michigan 48375	(248) 449-3426 email: tiffany.yusko@mwhglobal.com	(248) 344-0217
Claudia Schiller	MWH Site Staff	MWH 3950 E. Arrow Street Oscoda, Michigan 48750	(989) 739-4863 email: claudia.j.schiller@us.mwhglobal.com	(248) 344-0217
Bradley P. Varhol	PDBS Vendor	EON Products, Inc. P.O. Box 390246 Snellville, GA 30039	(800) 474-2490 web site: www.eonpro.com email: sales@eonpro.com	(770) 978-8661
Karen Sellers	Columbia Analytical Services Project Manager	CAS 5090 Catapillar Road Redding, CA 96003	(530) 244-5227 email: ksellers@redding.caslab.com	(530) 244-4109

5.0 SCHE

Work performed as part of this demonstration at Wurtsmith AFB will be completed according to the schedule summarized below.

- Submittal of the Draft Site-Specific PDBS Work Plan: 10 September 2002
- Receipt of Draft Site-Specific PDBS Work Plan Comments: 20 September 2002.
- Submittal of the Final Site-Specific PDBS Work Plan: 27 September 2002
- Install PDB samplers at Wurtsmith AFB: 30 September 2002
- Retrieve PDBS samplers at Wurtsmith AFB: 21 October 2002

- Submittal of the Preliminary Internal Draft Site-Specific PDBS Report: April 2003.

6.0 REPORTING

The site-specific results report will provide a table identifying the location and depth for each PDBS collected. The analytical results collected by Parsons as part of this study will be compared to conventional-sampling analytical results collected by the base contractor (i.e., MWH) using the procedures described in Section 3.2. The results of the statistical comparisons will be clearly and logically presented in the site-specific results report. Comparison methods will include calculation of RPDs between PDBS and conventional sampling results. In addition, the relative costs of PDB and conventional groundwater sampling will be compared.

The report will include a qualitative review of data sets when the correlation criteria for a well or compound are met in less than 70 percent of the comparisons. The purpose of this review will be to attempt to determine the most likely reason(s) for the lack of correlation. The arbitrary threshold value of 70 percent is not intended to indicate success or failure of PDBS, but rather to focus further review on those wells or analytes where a lower correlation was observed. If there are wells or compounds for which the correlation criteria were not as consistently met, and it's not clear that the poor correlation was due to a one-time, explainable occurrence (e.g., air bubbles in the sample vials for a particular sample), then the report will likely state that further evaluation of those wells/compounds should be performed before the PDBS method is used for those wells/compounds. The draft version of this report will be distributed according to the schedule shown in Section 5.0.

7.0 REFERENCES

Cummings, T.R., and Twenter, F.R., 1986, Assessment of ground-water contamination at Wurtsmith Air Force Base, Michigan, 1982-85: U.S. Geological Survey Water-Resources Investigations Report 86-4188, 120 p.

Montgomery Watson Harza Americas, Inc. (MWH), 2002. *Quality Assurance Project Plan (QAPP) and Sampling Analysis Plan (SAP) for Basewide Remedial Action-Operation for Wurtsmith AFB, Oscoda, Michigan.* May.

Parsons Engineering Science, Inc. (Parsons), 2002a. *Draft Work Plan for the Air Force Base Conversion Agency Passive Diffusion Sampler Demonstration.* February.

Parsons, 2002b. *Project Health and Safety Plan for Remedial Process Optimization Support and Demonstration of Passive Diffusion Bag Sampler Technology at Several Department of Defense Installations.* February

Stark, J.R., Cummings, T.R., and Twenter, F.R., 1983, Ground-water contamination at Wurtsmith Air Force Base, Michigan: U.S. Geological Survey Water-Resources Investigations Report 83-4002, 93 p.

Vroblesky, D.A., 2001. *User's Guide for Polyethylene-Based Passive Diffusion Bag Samplers to Obtain Volatile Organic Compound Concentrations in Wells.* US Geological Survey Water-Resources Investigations Report 01-4060. Columbia, South Carolina.

URS Greiner Corporation (URS), 2000. *Draft Consolidated Remedial Action Plan, Wurtsmith Air Force Base.* August.

US Geologic Survey (USGS). 1990. *Installation Restoration Program, Phase II, Confirmation/Quantification, Stage 2, Wurtsmith AFB, Michigan: An Environmental Database System, Final Report, Volumes I & II.* USGS Water Resources Division, Lansing, Michigan. August.

APPENDIX A

HEALTH AND SAFETY PLAN ADDENDUM

**ADDENDUM TO THE PROGRAM HEALTH AND SAFETY PLAN
FOR REMEDIAL PROCESS OPTIMIZATION SUPPORT AND
DEMONSTRATION OF PASSIVE DIFFUSION BAG SAMPLING
TECHNOLOGY
AT SEVERAL DEPARTMENT OF DEFENSE INSTALLATIONS**

AT

**WURTSMITH AIR FORCE BASE
MICHIGAN**

August 2002

Prepared by:

PARSONS

1700 Broadway, Suite 900
Denver, Colorado 80290

Reviewed and Approved By:

Project Manager

Office Health and Safety
Representative

Name

Date

A.R. Hicks
8/29/02

Damithy Mustard, CIH
8/29/02

1.0 INTRODUCTION

This addendum modifies the existing Program Health and Safety Plan (HASP) entitled *Program Health and Safety Plan for Remedial Process Optimization Support and Demonstration of Passive Diffusion Bag Sampling Technology at Several Department of Defense Installations* (Parsons Engineering Science, Inc., [Parsons] 2002) for the evaluation of the use of passive diffusion bag samplers (PDBSs) in existing groundwater monitoring programs at selected U.S. Air Force (USAF) and other Department of Defense installations across the United States. This work is being performed under contract number F44650-99-D-005 Delivery Order DK01, for the U.S. Department of the Army, Corps of Engineers, Omaha District, and Air Force Base Conversion Agency (AFBCA), Roslyn, Virginia.

This addendum to the Program HASP was prepared to address the upcoming tasks at Sites LF-30/31, SS-08, and SS-57 at Wurtsmith Air Force Base (AFB) in Michigan. Included or referenced in this addendum are the scope of services, site specific description and history, project team organization, hazard evaluation of physical hazards and of known or suspected chemicals, and emergency response information. All other applicable portions of the Program HASP remain in effect.

2.0 SCOPE OF SERVICES

Site activities will involve the placement of a water-filled diffusive membrane capsule in a well installation device at a specific depth in an existing groundwater monitoring well. The wells are located in various areas throughout the base. After a specified period of time, the water in the sampler is transferred to a sample container and submitted for laboratory analysis. No drilling or ground-intrusive activities are anticipated under the current scope of work.

3.0 SITE SPECIFIC DESCRIPTION HISTORY

The descriptions, history, and maps for the various sites are contained in the work plan entitled *Site-Specific Work Plan for the Passive Diffusion Bag Sampler Demonstration at Wurtsmith AFB, Michigan* (Parsons, 2002).

4.0 PROJECT TEAM ORGANIZATION

The project team assigned to the PDBS demonstration activities at the former Wurtsmith AFB is identified in the Program HASP. The following personnel also will be involved in this project.

Mr. Peter Guest	Project Manager
Mr. John Hicks	Task Manager
Mr. Tom Dragoo	Site Manager
Mr. Tom Dragoo	Site Health and Safety Officer
Mr. Paul Rekowski	Wurtsmith AFB Contact (AFBCA)

5.0 HAZARD EVALUATION

5.1 Chemical Hazards

The primary contaminants of concern at the various sites are naphthalene, benzene compounds, and some chlorinated compounds. Health hazard qualities for these and other compounds are presented in Table 5.1A for Site LF-30/31, Table 5.1B for Site SS-08, and Table 5.1C for Site 57 at the end of this addendum. If other contaminants are found to exist at the site, this addendum will be modified to include the necessary information that will then be communicated to the onsite personnel.

5.2 Physical Hazards

Potential physical hazards at the former Wurtsmith AFB include hazards associated with motor vehicles; slip, trip, and fall hazards; noise; and heat and/or cold exposure. These hazards are discussed in the Program HASP.

5.3 Biohazards

The following is in addition to the information presented in the Program HASP.

West Nile virus is spread by the bite of an infected mosquito, and can infect people, horses, many types of birds, and some other animals. Most people who become infected with West Nile virus will have either no symptoms or only mild ones. On rare occasions, West Nile virus infection can result in a severe and sometimes fatal illness known as West Nile encephalitis (an inflammation of the brain). The risk of severe disease is higher for persons 50 years of age and older. There is no evidence to suggest that West Nile virus can be spread from person to person or from animal to person.

Human illness from West Nile virus is rare, even in areas where the virus has been reported. The chance that any one person is going to become ill from a mosquito bite is low. You can further reduce your chances of becoming ill by protecting yourself from mosquito bites. To avoid mosquito bites, apply insect repellent containing DEET (N,N-diethyl-meta-toluamide) when you're outdoors. When possible, wear long-sleeved clothes and long pants treated with repellents containing permethrin or DEET since mosquitoes may bite through thin clothing. Do not apply repellents containing permethrin directly to exposed skin. If you spray your clothing, there is no need to spray repellent containing DEET on the skin under your clothing. Also, consider staying indoors at dawn, dusk, and in the early evening, which are peak mosquito biting times.

6.0 EMERGENCY RESPONSE PLAN

6.1 Emergency Contacts

In the event of any emergency situation or unplanned occurrence requiring assistance, the appropriate contacts should be made from the list below. A list of emergency contacts must be posted at the site.

<u>Contingency Contacts</u>	<u>Telephone Number</u>
Site/Medical Emergency	911
Iosco County Sheriff	(517) 362-6164
Michigan State Police	(517) 362-3434
Poison Control Center	(800) 632-2727
AFBCA Contact: Paul Rekowski	(989) 739-5161
MWH (on site) Contact: Claudia Schiller	(989) 739-4863

Medical Emergency: (Figure 6.1)

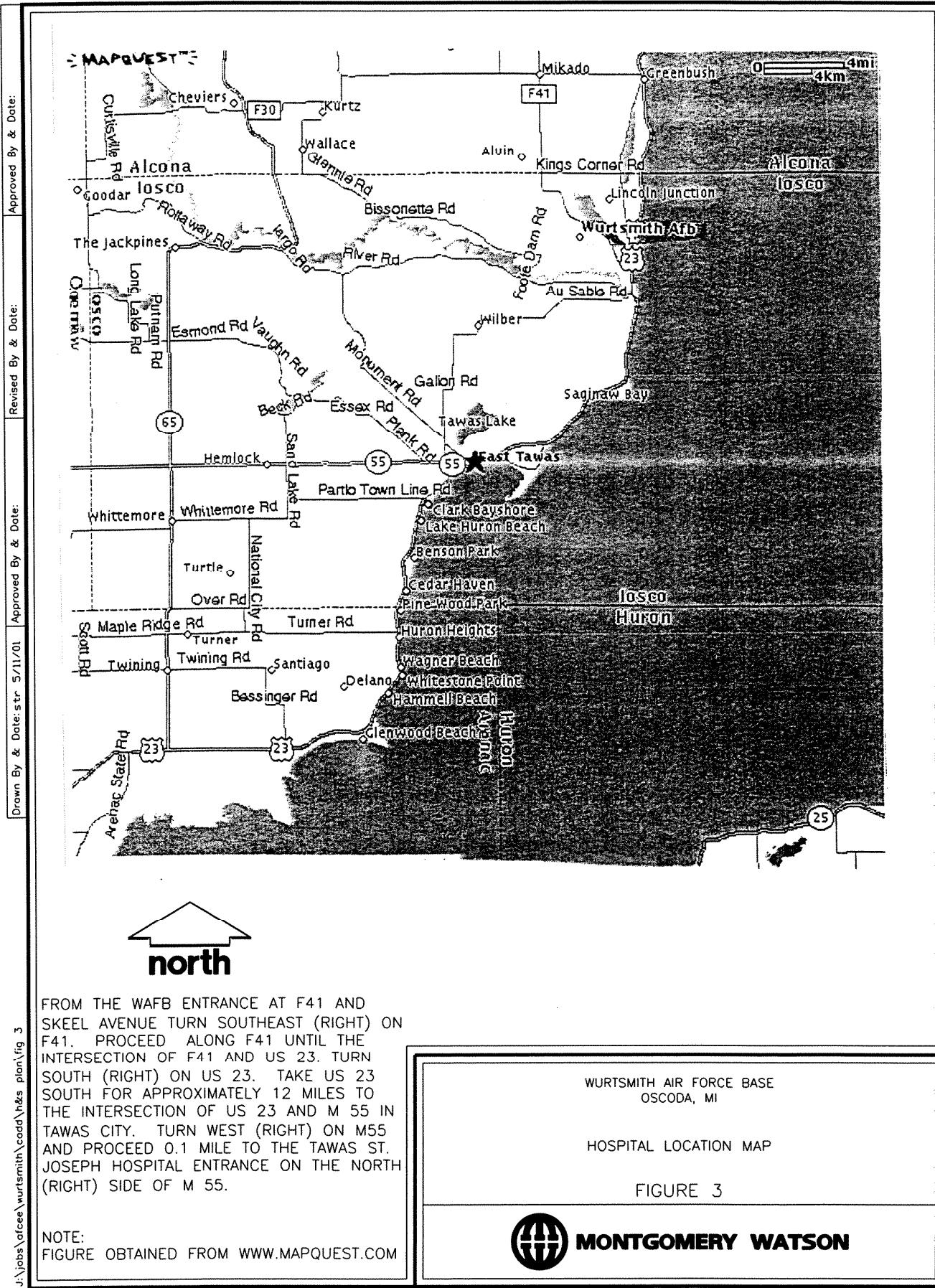
Hospital Name	Tawas Saint Joseph Hospital
Address	200 Hemlock, Tawas City, MI 48763
Telephone Number	911 or (517) 362-3411
Ambulance	911

Parsons Contacts

	<u>Telephone Number</u>
Peter Guest Project Manager	(303) 831-8100 or 764-1919 (Work)
John Hicks Task Manager	(303) 831-8100 or 764-1941 (Work) (303) 279-3698 (Home)
Tim Mustard, CIH Program Health and Safety Manager	(303) 831-8100 or 764-8810 (Work) (303) 450-9778 (Home)
Ed Grunwald, CIH Corporate Health and Safety Manager	(678) 969-2394 (Work) (404) 299-9970 (Home)
Judy Blakemore Assistant Program Health and Safety Manager	(303) 831-8100 or 764-8861 (Work) (303) 828-4028 (Home) (303) 817-9743 (Mobile)
Parsons 24-Hour Emergency Contact Service	(866) 727-1411 (toll free)

7.0 LEVELS OF PROTECTION AND PERSONAL PROTECTIVE EQUIPMENT REQUIRED FOR SITE ACTIVITIES

The personal protection level prescribed for field activities at the former Wurtsmith AFB is Occupational Safety and Health Administration (OSHA) Level D with a contingency for the use of OSHA Level C or B, as site conditions require. The following will be used to select respiratory protection at each of the sites.



If sustained air-monitoring readings in the worker-breathing zone indicate vapor concentrations greater than background for 30 seconds or longer, the field crew will be forced to evacuate and ventilate the area until readings are less than 1 part per million, volume by volume (ppmv) in the worker-breathing zone. If ventilation is inadequate, air samples will be taken to confirm or deny the existence of the contaminants of concern and/or the crew will upgrade to Level B respiratory protection. These air samples will be sent to a lab to be analyzed by US Environmental Protection Agency (USEPA) Compendium Method TO-14 or the equivalent. Decisions for further actions and for levels of respiratory protection will be made after consulting with the project manager and program health and safety manager.

Section 7 of the Program HASP contains guidelines for selection of personal protective equipment (PPE). PPE will be required when handling contaminated samples and when working with potentially contaminated materials. See page 7-4 of the Program HASP for PPE to be used.

8.0 FREQUENCY AND TYPES OF AIR MONITORING

A photoionization detector (PID) with an 11.7 electron volts (eV) (HNU[®]) or equivalent lamp will be used for air monitoring during this project since the ionization potentials of the contaminants of concern are below 11.7 eV.

TABLE 5.1A HEALTH HAZARD QUALITIES OF HAZARDOUS SUBSTANCES OF CONCERN - SITE LF-30/31

Compound	PEL ^{a/} (ppm)	TLV ^{b/} (ppm)	IDLH ^{c/} (ppm)	Odor Threshold ^{d/} (ppm)	Ionization Potential ^{e/} (eV)	Physical Description/Health Effects/Symptoms
Benzene	1 (29 CFR 1910.1028) ^{f/}	0.5 (skin) ^{g/}	500	4.7	9.24	Colorless to light-yellow liquid (solid<42°F) with an aromatic odor. Eye, nose, skin, and respiratory system irritant. Causes giddiness, headaches, nausea, staggered gait, fatigue, anorexia, exhaustion, dermatitis, bone marrow depression, and leukemia. Mutagen, experimental teratogen, and carcinogen.
Chlorobenzene	75	10	1,000	0.21-60	9.07	Colorless, liquid narcotic with an almond-like odor. Irritates eyes, nose, and skin. Causes drowsiness, incoordination, and CNS depression. In animals, causes lung and kidney injury. Mutagen and experimental teratogen.
1,2-Dibromo-3-chloropropane (Nemagon, DBCP)	0.001 (29 CFR 1910.1044) ^{f/}	NA ^{h/}	NA	0.1-0.03 mg/m ³ ^{i/}	NA	Dense, yellow or amber, liquid (solid<43°F) pesticide with a pungent odor at high concentrations. Irritates eyes, nose, skin, and throat. Causes drowsiness, nausea, vomiting, pulmonary edema, liver and kidney injury, and male sterility. Also affects spleen. In animals, causes cancer of the nasal cavity, tongue, pharynx, lungs,
Dichlorodifluoromethane (Freon [®] 12, Halon [®] 122)	1,000	1,000	15,000	NA	11.75	Colorless gas with an ether-like odor at extremely high concentrations. Causes dizziness, tremors, asphyxia, unconsciousness, cardiac arrhythmia, cardiac arrest, and frostbite (liquid).
1,1-Dichloroethane (DCA)	100	100	3,000	120	11.06	Colorless, oily liquid with chloroform-like odor and hot saccharine taste. Irritates skin. Causes CNS depression and kidney, lung, and liver damage. Experimental teratogen and questionable carcinogen.
1,2-Dichloroethene (DCE) (cis- and trans-isomers)	200	200	1,000	0.085-500	9.65	Colorless liquid (usually a mixture of cis- and trans- isomers), with a slightly acrid, chloroform-like odor. Irritates eyes and respiratory system. CNS depressant. Cis-isomer is a mutagen.
Ethylbenzene	100	100	800 (10% LEL) ^{j/}	0.25-200	8.76	Colorless liquid with an aromatic odor. Irritates eyes, skin, and mucous membranes. Causes dermatitis, headaches, narcosis, and coma. Mutagen and experimental teratogen.
Isopropyl Benzene (Cumene)	50 (skin)	50	900 (10% of LEL)	0.088-0.132	8.75	Colorless liquid with a sharp, penetrating, aromatic, and gasoline-like odor. Irritates eyes, skin, nose, mouth, throat, and mucous membranes. Causes dermatitis, headaches, CNS depression, narcosis, dizziness, light-headedness, vertigo, incoordination, ringing in ears, confusion, tremors, substernal pain, cough, hoarseness, nausea, vomiting, coma, and liver and kidney damage.
Naphthalene	10	10	250	0.3	8.12	Colorless to brown solid (shipped as a molten liquid) with a mothball-like odor. Irritates eyes, skin, and bladder. Causes headaches, confusion, excitement, convulsions, coma, vague discomfort, nausea, vomiting, abdominal pain, profuse sweating, jaundice, hematoma, hemoglobin in the urine, renal shutdown, dermatitis, optic nerve disorders, and corneal and liver damage. Experimental teratogen and questionable carcinogen.
Propyl Benzene (Isocumene)	NA	NA	NA	NA	NA	Colorless to light-yellow liquid. Irritates eyes, nose, throat, and skin. Causes CNS depression, headaches, anorexia, dizziness, muscular weakness, incoordination,

TABLE 5.1A HEALTH HAZARD QUALITIES OF HAZARDOUS SUBSTANCES OF CONCERN - SITE LF-30/31

Compound	PEL ^{a/} (ppm)	TLV ^{b/} (ppm)	IDLH ^{c/} (ppm)	Odor Threshold ^{d/} (ppm)	Ionization Potential ^{e/} (eV)	Physical Description/Health Effects/Symptoms
Trichloroethylene (TCE)	50	50	1,000	21.4-400	9.45	Clear, colorless or blue liquid with chloroform-like odor. Irritates skin and eyes. Causes fatigue, giddiness, headaches, vertigo, visual disturbances, tremors, nausea, vomiting, drowsiness, dermatitis, skin tingling, cardiac arrhythmia, and liver injury. In animals, causes liver and kidney cancer. Mutagen, experimental teratogen, and carcinogen.
1,2,4-Trimethylbenzene (Pseudocumene)	25	25	NA	0.027	8.27	Colorless liquid with a distinctive, aromatic odor. Irritates eyes, skin, nose, throat, and respiratory system. Causes bronchitis, hypochromic anemia, headaches, drowsiness, fatigue, dizziness, nausea, incoordination, vomiting, confusion, CNS depression, and chemical pneumonia.
1,3,5-Trimethylbenzene (Mesitylene)	25 ^{k/}	25 ^{k/}	NA	0.027 ^{k/}	8.39	Colorless liquid with a distinctive, aromatic odor. Irritates eyes, skin, nose, throat, and respiratory system. Causes bronchitis, hypochromic anemia, headaches, drowsiness, fatigue, dizziness, nausea, incoordination, vomiting, confusion, and chemical pneumonia. Mutagen.
Vinyl Chloride	1 (29 CFR 1910.1017) ^{f/}	1	NA	260	9.99	Colorless gas (liquid<7°F) with a pleasant odor at high concentrations. Severe irritant to skin, eyes, and mucous membranes. Causes weakness, abdominal pain, gastrointestinal bleeding, enlarged liver, pallor or blue skin on the extremities, liver cancer, and frostbite (liquid). Also attacks lymphatic system. Mutagen, experimental teratogen, and carcinogen.
Xylene (o-, m-, and p-isomers)	100	100	900	0.05-200 ^{l/}	8.56 8.44 (p)	Colorless liquid with aromatic odor. P-isomer is a solid <56°F. Irritates eyes, skin, nose, and throat. Causes dizziness, drowsiness, staggered gait, incoordination, irritability, excitement, corneal irregularities, conjunctivitis, dermatitis, anorexia, nausea, vomiting, abdominal pain, and olfactory and pulmonary changes. Also targets blood, liver, and kidneys. Mutagen and experimental teratogen.

a/ PEL = Permissible Exposure Limit. OSHA-enforced average air concentration to which a worker may be exposed for an 8-hour workday without harm.

Expressed as parts per million (ppm) unless noted otherwise. PELs are published in the *NIOSH Pocket Guide to Chemical Hazards*, 1997. Some states (such as California) may have more restrictive PELs. Check state regulations.b/ TLV = Threshold Limit Value - Time-Weighted Average. Average air concentration (same definition as PEL, above) recommended by the American Conference of Governmental Industrial Hygienists (ACGIH), 2001 *TVLs® and BEIs®*.c/ IDLH = Immediately Dangerous to Life or Health. Air concentration at which an unprotected worker can escape without debilitating injury or health effects. Expressed as ppm unless noted otherwise. IDLH values are published in the *NIOSH Pocket Guide to Chemical Hazards*, 1997.

d/ When a range is given, use the highest concentration.

e/ Ionization Potential, measured in electron volts (eV), used to determine if field air monitoring equipment can detect substance. Values are published in the *NIOSH Pocket Guide to Chemical Hazards*, June 1997.

f/ Refer to expanded rules for this compound.

g/ (skin) = Refers to the potential contribution to the overall exposure by the cutaneous route.

h/ NA = Not available.

i/ mg/m³ = milligrams per cubic meter.j/ Indicates that the IDLH value was based on 10% of the lower explosive limit for safety considerations, even though relevant toxicological data indicated that irreversible health effects or impairment of escape existed only at higher concentrations (*NIOSH Pocket Guide to Chemical Hazards*, 1997).

k/ Based on 1,2,4-Trimethylbenzene.

l/ Olfactory fatigue has been reported for the compound and odor may not serve as an adequate warning property.

TABLE 5.1B HEALTH HAZARD QUALITIES OF HAZARDOUS SUBSTANCES OF CONCERN - SITE SS-08

Compound	PEL ^{a/} (ppm)	TLV ^{b/} (ppm)	IDLH ^{c/} (ppm)	Odor Threshold ^{d/} (ppm)	Ionization Potential ^{e/} (eV)	Physical Description/Health Effects/Symptoms
Ethylbenzene	100	100	800 (10% LEL) ^{f/}	0.25-200	8.76	Colorless liquid with an aromatic odor. Irritates eyes, skin, and mucous membranes. Causes dermatitis, headaches, narcosis, and coma. Mutagen and experimental teratogen.
Isopropyl Benzene (Cumene)	50 (skin) ^{g/}	50	900 (10% of LEL)	0.088-0.132	8.75	Colorless liquid with a sharp, penetrating, aromatic, and gasoline-like odor. Irritates eyes, skin, nose, mouth, throat, and mucous membranes. Causes dermatitis, headaches, CNS depression, narcosis, dizziness, light-headedness, vertigo, incoordination, ringing in ears, confusion, tremors, substernal pain, cough, hoarseness, nausea, vomiting, coma, and liver and kidney damage.
Methylene Chloride (Dichloromethane, Methylene Dichloride)	25	50	2,300	25-320	11.32	Colorless liquid (gas>104°F) with a sweet, chloroform-like odor (not noticeable at dangerous concentrations). Irritates eyes and skin. Causes nausea, vomiting, fatigue, weakness, unnatural drowsiness, light-headedness, numbness, tingling limbs, and nausea. In animals, causes lung, liver, salivary and mammary gland tumors. Mutagen, experimental teratogen, and carcinogen.
Naphthalene	10	10	250	0.3	8.12	Colorless to brown solid (shipped as a molten liquid) with a mothball-like odor. Irritates eyes, skin, and bladder. Causes headaches, confusion, excitement, convulsions, coma, vague discomfort, nausea, vomiting, abdominal pain, profuse sweating, jaundice, hematoma, hemoglobin in the urine, renal shutdown, dermatitis, optic nerve disorders, and corneal and liver damage. Experimental teratogen and questionable carcinogen.
Propyl Benzene (Isocumene)	NA ^{h/}	NA	NA	NA	NA	Colorless to light-yellow liquid. Irritates eyes, nose, throat, and skin. Causes CNS depression, headaches, anorexia, dizziness, muscular weakness, incoordination,
1,2,4-Trimethylbenzene (Pseudocumene)	25	25	NA	0.027	8.27	Colorless liquid with a distinctive, aromatic odor. Irritates eyes, skin, nose, throat, and respiratory system. Causes bronchitis, hypochromic anemia, headaches, drowsiness, fatigue, dizziness, nausea, incoordination, vomiting, confusion, CNS depression, and chemical pneumonia.
1,3,5-Trimethylbenzene (Mesitylene)	25 ^{i/}	25 ^{i/}	NA	0.027 ^{i/}	8.39	Colorless liquid with a distinctive, aromatic odor. Irritates eyes, skin, nose, throat, and respiratory system. Causes bronchitis, hypochromic anemia, headaches, drowsiness, fatigue, dizziness, nausea, incoordination, vomiting, confusion, and chemical pneumonia. Mutagen.

TABLE 5.1B HEALTH HAZARD QUALITIES OF HAZARDOUS SUBSTANCES OF CONCERN - SITE SS-08

Compound	PEL ^{a/} (ppm)	TLV ^{b/} (ppm)	IDLH ^{c/} (ppm)	Odor Threshold ^{d/} (ppm)	Ionization Potential ^{e/} (eV)	Physical Description/Health Effects/Symptoms
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a/ PEL = Permissible Exposure Limit. OSHA-enforced average air concentration to which a worker may be exposed for an 8-hour workday without harm. Expressed as parts per million (ppm) unless noted otherwise. PELs are published in the *NIOSH Pocket Guide to Chemical Hazards*, 1997. Some states (such as California) may have more restrictive PELs. Check state regulations.

b/ TLV = Threshold Limit Value - Time-Weighted Average. Average air concentration (same definition as PEL, above) recommended by the American Conference of Governmental Industrial Hygienists (ACGIH), 2001 *TVLs® and BEIs®*.

c/ IDLH = Immediately Dangerous to Life or Health. Air concentration at which an unprotected worker can escape without debilitating injury or health effects. Expressed as ppm unless noted otherwise. IDLH values are published in the *NIOSH Pocket Guide to Chemical Hazards*, 1997.

d/ When a range is given, use the highest concentration.

e/ Ionization Potential, measured in electron volts (eV), used to determine if field air monitoring equipment can detect substance. Values are published in the *NIOSH Pocket Guide to Chemical Hazards*, June 1997.

f/ Indicates that the IDLH value was based on 10% of the lower explosive limit for safety considerations, even though relevant toxicological data indicated that irreversible health effects or impairment of escape existed only at higher concentrations (*NIOSH Pocket Guide to Chemical Hazards*, 1997).

g/ (skin) = Refers to the potential contribution to the overall exposure by the cutaneous route.

h/ NA = Not available.

i/ Based on 1,2,4-Trimethylbenzene.

TABLE 5.1C HEALTH HAZARD QUALITIES OF HAZARDOUS SUBSTANCES OF CONCERN - SITE SS-57

Compound	PEL ^{a/} (ppm)	TLV ^{b/} (ppm)	IDLH ^{c/} (ppm)	Odor Threshold ^{d/} (ppm)	Ionization Potential ^{e/} (eV)	Physical Description/Health Effects/Symptoms
Benzene	1 (29 CFR 1910.1028) ^{f/}	0.5 (skin) ^{g/}	500	4.7	9.24	Colorless to light-yellow liquid (solid<42°F) with an aromatic odor. Eye, nose, skin, and respiratory system irritant. Causes giddiness, headaches, nausea, staggered gait, fatigue, anorexia, exhaustion, dermatitis, bone marrow depression, and leukemia. Mutagen, experimental teratogen, and carcinogen.
n-Butyl Benzene	NA ^{h/}	NA	NA	NA	NA	Colorless liquid. Mildly toxic by ingestion. In rats, causes fibrosis, lung irritation, pulmonary edema, and hemorrhaging.
sec-Butyl Benzene	NA	NA	NA	NA	NA	Colorless liquid.
2,4-Dimethylphenol (2,4-Xylenol)	NA	NA	NA	0.001 mg/m ³ ^{i/}	NA	Colorless, odorless crystals, toxic by ingestion and skin absorption. Questionable carcinogen.
Ethylbenzene	100	100	800 (10% LEL) ^{j/}	0.25-200	8.76	Colorless liquid with an aromatic odor. Irritates eyes, skin, and mucous membranes. Causes dermatitis, headaches, narcosis, and coma. Mutagen and experimental teratogen.
Isopropyl Benzene (Cumene)	50 (skin)	50	900 (10% of LEL)	0.088-0.132	8.75	Colorless liquid with a sharp, penetrating, aromatic, and gasoline-like odor. Irritates eyes, skin, nose, mouth, throat, and mucous membranes. Causes dermatitis, headaches, CNS depression, narcosis, dizziness, light-headedness, vertigo, incoordination, ringing in ears, confusion, tremors, substernal pain, cough, hoarseness, nausea, vomiting, coma, and liver and kidney damage.
p-Isopropyltoluene (p-Cymene)	NA	NA	NA	NA	NA	Colorless to pale-yellow liquid with a mild, sweet aromatic, solvent-like odor. Irritates eyes, skin, mouth, and stomach. Causes chemical pneumonia, skin redness,
2-Methylnaphthalene	NA	NA	NA	0.003-0.04	7.96	Colorless gas or solid with a disagreeable garlic or rotten cabbage odor. Irritates eyes, skin, nose, and throat.
Naphthalene	10	10	250	0.3	8.12	Colorless to brown solid (shipped as a molten liquid) with a mothball-like odor. Irritates eyes, skin, and bladder. Causes headaches, confusion, excitement, convulsions, coma, vague discomfort, nausea, vomiting, abdominal pain, profuse sweating, jaundice, hematoma, hemoglobin in the urine, renal shutdown, dermatitis, optic nerve disorders, and corneal and liver damage. Experimental teratogen and questionable carcinogen.
Propyl Benzene (Isocumene)	NA	NA	NA	NA	NA	Colorless to light-yellow liquid. Irritates eyes, nose, throat, and skin. Causes CNS depression, headaches, anorexia, dizziness, muscular weakness, incoordination,

TABLE 5.1C HEALTH HAZARD QUALITIES OF HAZARDOUS SUBSTANCES OF CONCERN - SITE SS-57

Compound	PEL ^{a/} (ppm)	TLV ^{b/} (ppm)	IDLH ^{c/} (ppm)	Odor Threshold ^{d/} (ppm)	Ionization Potential ^{e/} (eV)	Physical Description/Health Effects/Symptoms
Toluene	100	50 (skin)	500	0.2-40 ^{k/}	8.82	Colorless liquid with sweet, pungent, benzene-like odor. Irritates eyes and nose. Causes fatigue, weakness, dizziness, headaches, hallucinations or distorted perceptions, confusion, euphoria, dilated pupils, nervousness, tearing, muscle fatigue, insomnia, skin tingling, dermatitis, bone marrow changes, and liver and kidney damage. Mutagen and experimental teratogen.
1,2,4-Trichlorobenzene	5 (ceiling) ^{l/}	5 (ceiling)	NA	NA	9.04	Colorless liquid or crystalline solid (<63°F) with an aromatic odor. Irritates eyes, skin, and mucous membranes. In animals, causes liver and kidney damage and possible teratogenic effects. Experimental teratogen.
Trichloroethene (TCE)	50	50	1,000	21.4-400	9.45	Clear, colorless or blue liquid with chloroform-like odor. Irritates skin and eyes. Causes fatigue, giddiness, headaches, vertigo, visual disturbances, tremors, nausea, vomiting, drowsiness, dermatitis, skin tingling, cardiac arrhythmia, and liver injury. In animals, causes liver and kidney cancer. Mutagen, experimental teratogen, and carcinogen.
1,2,4-Trimethylbenzene (Pseudocumene)	25	25	NA	0.027	8.27	Colorless liquid with a distinctive, aromatic odor. Irritates eyes, skin, nose, throat, and respiratory system. Causes bronchitis, hypochromic anemia, headaches, drowsiness, fatigue, dizziness, nausea, incoordination, vomiting, confusion, CNS depression, and chemical pneumonia.
1,3,5-Trimethylbenzene (Mesitylene)	25 ^{m/}	25 ^{m/}	NA	0.027 ^{m/}	8.39	Colorless liquid with a distinctive, aromatic odor. Irritates eyes, skin, nose, throat, and respiratory system. Causes bronchitis, hypochromic anemia, headaches, drowsiness, fatigue, dizziness, nausea, incoordination, vomiting, confusion, and chemical pneumonia. Mutagen.
Xylene (o-, m-, and p-isomers)	100	100	900	0.05-200 ^{k/}	8.56 8.44 (p)	Colorless liquid with aromatic odor. P-isomer is a solid <56°F. Irritates eyes, skin, nose, and throat. Causes dizziness, drowsiness, staggered gait, incoordination, irritability, excitement, corneal irregularities, conjunctivitis, dermatitis, anorexia, nausea, vomiting, abdominal pain, and olfactory and pulmonary changes. Also targets blood, liver, and kidneys. Mutagen and experimental teratogen.

TABLE 5.1C HEALTH HAZARD QUALITIES OF HAZARDOUS SUBSTANCES OF CONCERN - SITE SS-57

Compound	PEL ^{a/} (ppm)	TLV ^{b/} (ppm)	IDLH ^{c/} (ppm)	Odor Threshold ^{d/} (ppm)	Ionization Potential ^{e/} (eV)	Physical Description/Health Effects/Symptoms
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a/ PEL = Permissible Exposure Limit. OSHA-enforced average air concentration to which a worker may be exposed for an 8-hour workday without harm. Expressed as parts per million (ppm) unless noted otherwise. PELs are published in the *NIOSH Pocket Guide to Chemical Hazards*, 1997. Some states (such as California) may have more restrictive PELs. Check state regulations.

b/ TLV = Threshold Limit Value - Time-Weighted Average. Average air concentration (same definition as PEL, above) recommended by the American Conference of Governmental Industrial Hygienists (ACGIH), 2001 *TVLs® and BEIs®*.

c/ IDLH = Immediately Dangerous to Life or Health. Air concentration at which an unprotected worker can escape without debilitating injury or health effects. Expressed as ppm unless noted otherwise. IDLH values are published in the *NIOSH Pocket Guide to Chemical Hazards*, 1997.

d/ When a range is given, use the highest concentration.

e/ Ionization Potential, measured in electron volts (eV), used to determine if field air monitoring equipment can detect substance. Values are published in the *NIOSH Pocket Guide to Chemical Hazards*, June 1997.

f/ Refer to expanded rules for this compound.

g/ (skin) = Refers to the potential contribution to the overall exposure by the cutaneous route.

h/ NA = Not available.

i/ mg/m³ = milligrams per cubic meter.

j/ Indicates that the IDLH value was based on 10% of the lower explosive limit for safety considerations, even though relevant toxicological data indicated that irreversible health effects or impairment of escape existed only at higher concentrations (*NIOSH Pocket Guide to Chemical Hazards*, 1997).

k/ Olfactory fatigue has been reported for the compound and odor may not serve as an adequate warning property.

l/ (ceiling) = Ceiling concentration which should not be exceeded at any time.

m/ Based on 1,2,4-Trimethylbenzene.

APPENDIX B

HISTORIC SITE DATA

H75S

Volatile Organic Compounds (VOCs)

LF30/LF31

Lab: Date: Method: Unit	CT & E 11/13/97 8260 ug/L	Quanterra 9/14/98 8260 ug/L	JPB 7/31/99 8260 ug/L	JPB 7/15/00 8260 ug/L	CAS 11/2/01 8260 ug/L	CAS 2/13/02 8260 ug/L	CAS 5/13/02 8260 ug/L		
1,1,1,2-Tetrachloroethane	<1.0	<1.2	<6.3	<10	<0.5	<0.5	<0.5		
1,1,1-TCA (Trichloroethane)	<1.0	<2.0	<10	<16	<0.8	<0.8	<0.8		
1,1,2,2-Tetrachloroethane	<1.0	<1.2	<5	<8	<0.4	<0.4	<0.4		
1,1,2-TCA (Trichloroethane)	<1.0	<2.5	<13	<20	<1.0	<1.0	<1.0		
1,1-DCA (Dichloroethane)	<1.0	<1.2	<5	<8	<0.4	<0.4	<0.4		
1,1-DCE (Dichloroethylene)	<1.0	<3.0	<15	<24	<1.2	<1.2	<1.2		
1,1-Dichloropropene	<1.0	<2.5	<13	<20	<1.0	<1.0	<1.0		
1,2,3-Trichlorobenzene	<1.0	<1.2	<3.8	<6	<0.3	<0.3	<0.3		
1,2,3-Trichloropropane	<1.0	<8.0	<40	<64	<3.2	<3.2	<3.2		
1,2,4-Trichlorobenzene	<1.0	<1.2	<5	<8	<0.4	<0.4	<0.4		
1,2,4-Trimethylbenzene	<1.0	<3.2	<16	<26	<1.3	0.18 F	<1.3		
1,2-DCA (Dichloroethane)	<1.0	<1.5	<7.5	<12	<0.6	<0.6	<0.6		
1,2-DCB (Dichlorobenzene)	<1.0	<1.2	<3.8	<6	<0.3	<0.3	<0.3		
1,2-Dibromo-3-Chloropropane	<1.0	<6.5	<33	<52	<2.6	<2.6	<2.6		
1,2-Dichloropropane	<1.0	1.8	<5.0	<8	<0.4	<0.4	<0.4		
1,2-EDB (Dibromoethane)	<1.0	<1.5	<7.5	<12	<0.6	<0.6	<0.6		
1,3,5-Trimethylbenzene	<1.0	<1.2	<6.3	<10	<0.5	<0.5	<0.5		
1,3-DCB (Dichlorobenzene)	<1.0	<3.0	<15	<24	<1.2	<1.2	<1.2		
1,3-Dichloropropene		<1.2	<5	<8	<0.4	<0.4	<0.4		
1,4-DCB (Dichlorobenzene)	<1.0	<1.2	<3.8	<6	<0.3	<0.3	<0.3		
1-Chlorohexane		<1.2	<6.3	<10	<0.5	<0.5	<0.5		
2,2-Dichloropropane	<1.0	<8.8	<44	<70	<3.5	<3.5	<3.5		
2-Butanone(MEK)	<5.0								
2-Chloroethyl Vinyl Ether	<5.0								
2-Chlorotoluene	<1.0	<1.2	<5	<8	<0.4	<0.4	<0.4		
2-Hexanone(MBK)	<5.0								
4-Chlorotoluene	<1.0	<1.5	<7.5	<12	<0.6	<0.6	<0.6		
4-Methyl-2-pentanone(MIBK)	<5.0								
Acetone	<5.0								
Acrolein	<5.0								
Acrylonitrile	<5.0								
Benzene	5	1.2	<5	<8	<0.4	<0.4	<0.4		
Bromobenzene	<1.0	<1.2	<3.8	<6	<0.3	<0.3	<0.3		
Bromochloromethane	<1.0	<1.2	<5	<8	<0.4	<0.4	<0.4		
Bromodichloromethane	<1.0	<2.0	<10	<16	<0.8	<0.8	<0.8		
Bromoform	<1.0	<3.0	<15	<24	<1.2	<1.2	<1.2		
Bromomethane	<1.0	<2.8	<14	<22	<1.1	<1.1	<1.1		
Carbon Disulfide	<3.0								
Carbon Tetrachloride	<1.0	<5.2	<26	<42	<2.1	<2.1	<2.1		
Chlorobenzene	<1.0	<1.2	<5	<8	<0.4	<0.4	<0.4		
Chloroethane	<1.0	10	<13	<20	<1.0	<1.0	<1.0		
Chloroform	<1.0	<1.2	<3.8	<6	<0.3	<0.3	<0.3		
Chloromethane	<1.0	<3.2	<16	<26	<1.3	<1.3	<1.3		
cis-1,2-Dichloroethene	140	170	28.2	35.3	20.90	8.87	13.44		
cis-1,3-Dichloropropene	<1.0	<2.5	<13	<20	<1.0	<1.0	<1.0		
Dibromochloromethane	<1.0	<1.2	<6.3	<10	<0.5	<0.5	<0.5		
Dibromomethane	<1.0	<6.0	<30	<48	<2.4	<2.4	<2.4		
Dichlorodifluoromethane	<1.0	<2.5	<13	<20	<1.0	<1.0	<1.0		
Ethylbenzene	<1.0	<1.5	<7.5	<12	<0.6	<0.6	<0.6		
Hexachlorobutadiene	<1.0	<2.8	<14	<22	<1.1	<1.1	<1.1		
Isopropyl Benzene	<1.0	<1.2	<6.3	<10	<0.5	<0.5	<0.5		
m & p Xylene	<2.0	<1.2	<7.5	<12	0.44*	0.32 F	<1.0		
Methylene Chloride	<2.0	<12	<3.8	<6	<0.3	<0.3	<0.3		
Methyl-tert-butyl Ether	<1.0								
Naphthalene	<1.0	<2.5	<5	<8	<0.4	<0.4	<0.4		
n-Butylbenzene	<1.0	<2.8	<14	<22	<1.1	<1.1	<1.1		
n-Propyl Benzene	<1.0	<1.2	<5	<8	<0.4	<0.4	<0.4		
o-Xylene	<1.0	<2.8	<14	<22	<1.1	<1.1	<1.1		
PCE (Tetrachloroethylene)	<1.0	<3.5	<18	<28	<1.4	<1.4	<1.4		
p-Isopropyltoluene	<1.0	<3.0	<15	<24	<1.2	<1.2	<1.2		
sec-Butylbenzene	<1.0	<3.2	<16	<26	<1.3	<1.3	<1.3		
Styrene	<1.0	<1.2	<5	<8	<0.4	<0.4	<0.4		
TCE (Trichloroethylene)	30	180	206	131	27.08	6.71	21.48		
Tert-Butylbenzene	<1.0	<3.5	<18	<28	<1.4	<1.4	<1.4		
Toluene	33	<2.8	<14	<22	0.27*	0.31 F	<1.1		
trans-1,2-Dichloroethylene	2	3.8	<7.5	<12	0.77	<0.6	<0.6		
trans-1,3-Dichloropropene	<1.0	<2.5	<13	<20	<1.0	<1.0	<1.0		
Trichlorofluoromethane	<1.0	<2.0	<10	<16	<0.8	<0.8	<0.8		
Vinyl Acetate	<1.0								
Vinyl Chloride	<1.0	<2.8	<14	<22	<1.1	<1.1	<1.1		
Xylene-Total	<3.0	<4.0							

Notes:

Only the results that are greater than the detection limit are highlighted.

* Indicates that the analytical results have been qualified by either the laboratory or by MWH as a result of data validation.

Lab: Date: Method: Units:	CT & E 5/17/95 8260 ug/L	ETOS 8/16/95 601-602 ug/L	CT & E 9/18/96 601-602 ug/L	CT&E 11/12/97 8260 ug/L	Quanterra 9/14/98 8260 ug/L	JPB 7/15/00 8260 ug/L	CAS 11/2/01 8260 ug/L	CAS 5/15/02 8260 ug/L
1,1,1,2-Tetrachloroethane	<1.0			<1.0	<0.50	<0.5	<0.5	<0.5
1,1,1-TCA (Trichloroethane)	<1.0	<1.0	<1.0	<1.0	<0.80	<0.8	<0.8	<0.8
1,1,2,2-Tetrachloroethane	<1.0	<1.0	<1.0	<1.0	<0.50	<0.4	<0.4	<0.4
1,1,2-TCA (Trichloroethane)	<1.0	<1.0	<1.0	<1.0	<1.0	<1	<1.0	<1.0
1,1-DCA (Dichloroethane)	<1.0	<1.0	3	2	0.60	0.842	0.55	0.72
1,1-DCE (Dichloroethylene)	<1.0	<1.0	<1.0	<1.0	<1.2	<1.2	<1.2	<1.2
1,1-Dichloropropene	<1.0			<1.0	<1.0	<1	<1.0	<1.0
1,2,3-Trichlorobenzene	<1.0			<5.0	<0.50	<0.3	<0.3	<0.3
1,2,3-Trichloropropane	<1.0			<1.0	<3.2	<3.2	<3.2	<3.2
1,2,4-Trichlorobenzene	<1.0			<2.0	<0.50	<0.4	<0.4	<0.4
1,2,4-Trimethylbenzene	<1.0			1	<1.3	<1.3	<1.3	<1.3
1,2-DCA (Dichloroethane)	<1.0	<1.0	<1.0	<1.0	<0.60	<0.6	<0.6	<0.6
1,2-DCB (Dichlorobenzene)	<1.0	<1.0	<1.0	<1.0	<0.50	<0.3	<0.3	<0.3
1,2-Dibromo-3-Chloropropane	<1.0			<1.0	<2.6	<2.6	<2.6	<2.6
1,2-Dichloropropane	<1.0	<1.0	<1.0	<1.0	<0.50	<0.4	<0.4	0.26 F
1,2-EDB (Dibromoethane)	<1.0			<1.0	<0.60	<0.6	<0.6	<0.6
1,3,5-Trimethylbenzene	<1.0			<1.0	<0.50	<0.5	<0.5	<0.5
1,3-DCB (Dichlorobenzene)	<1.0	<1.0	<1.0	<1.0	<1.2	<1.2	<1.2	<1.2
1,3-Dichloropropane					<0.50	<0.4	<0.4	<0.4
1,4-DCB (Dichlorobenzene)	<1.0	<1.0	<1.0	<1.0	<0.50	<0.3	<0.3	<0.3
1-Chlorohexane					<0.50	<0.5	<0.5	<0.5
2,2-Dichloropropane	<1.0			<1.0	<3.5	<3.5	<3.5	<3.5
2-Butanone(MEK)	<50			<5.0				
2-Chloroethyl Vinyl Ether	<50	<10	<10	<5.0				
2-Chlorotoluene	<1.0			<1.0	<0.50	<0.4	<0.4	<0.4
2-Hexanone(MBK)	<50			<5.0				
4-Chlorotoluene	<1.0			<1.0	<0.60	<0.6	<0.6	<0.6
4-Methyl-2-pentanone(MIBK)	<50			<5.0				
Acetone	<50			<5.0				
Acrolein	<100			<5.0				
Acrylonitrile	<100			<5.0				
Benzene	2	<1.0	1.0	4	1.3	1.29	0.28*	0.49
Bromobenzene	<1.0			<1.0	<0.50	<0.3	<0.3	<0.3
Bromochloromethane	<1.0			<1.0	<0.50	<0.4	<0.4	<0.4
Bromodichloromethane	<1.0	<1.0	<1.0	<1.0	<0.80	<0.8	<0.8	<0.8
Bromoform	<1.0	<1.0	<1.0	<1.0	<1.2	<1.2	<1.2	<1.2
Bromomethane	<1.0	<1.0	<1.0	<1.0	<1.1	<1.1	<1.1	<1.1
Carbon Disulfide	<50			<1.0				
Carbon Tetrachloride	<1.0	<1.0	<1.0	<1.0	<2.1	<2.1	<2.1	<2.1
Chlorobenzene	<1.0	<1.0	<1.0	<1.0	<0.50	<0.4	<0.4	<0.4
Chloroethane	<1.0	<1.0	<1.0	<1.0	6.1	<1	<1.0	<1.0
Chloroform	<1.0	<1.0	<1.0	<1.0	<0.50	<0.3	<0.3	<0.3
Chloromethane	<1.0	<1.0	<1.0	<2.0	<1.3	<1.3	0.12*	<1.03
cis-1,2-Dichloroethene	<1.0			1	<1.2	<1.2	<1.2	<1.2
cis-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0	<1.0	<1	<1.0	<1.0
Dibromochloromethane	<1.0	<1.0	<1.0	<1.0	<0.50	<0.5	<0.5	<0.5
Dibromomethane	<1.0			<1.0	<2.4	<2.4	<2.4	<2.4
Dichlorodifluoromethane	1	<1.0	4	<2.0	<1.0	<1	0.09*	1.03
Ethylbenzene	<1.0	<1.0	<1.0	1	<0.60	<0.6	<0.6	<0.6
Hexachlorobutadiene	<1.0			<1.0	<1.1	<1.1	<1.1	<1.1
Isopropyl Benzene	<1.0			<1.0	<0.50	<0.5	<0.5	<0.5
m & p Xylene	<1.0			2	<0.60	0.904	0.41*	<1.0
Methylene Chloride	<1.0	<1.0	2	<1.0	<5.0	<0.3	<0.3	<0.3
Methyl-tert-butyl Ether	<50			<1.0				
Naphthalene	<1.0			<2.0	<1.0	<0.4	<0.4	<0.4
n-Butylbenzene	<1.0			<1.0	<1.1	<1.1	<1.1	<1.1
n-Propyl Benzene	<1.0			<1.0	<0.50	<0.4	<0.4	<0.4
o-Xylene	<1.0			<1.0	<1.1	<1.1	0.58*	<1.1
PCE (Tetrachloroethylene)	<1.0	<1.0	<1.0	<1.0	<1.4	<1.4	<1.4	<1.4
p-Isopropyltoluene	<1.0			<1.0	<1.2	<1.2	<1.2	<1.2
sec-Butylbenzene	<1.0			<1.0	<1.3	<1.3	<1.3	<1.3
Styrene	<1.0			<1.0	<0.50	<0.4	<0.4	<0.4
TCE (Trichloroethylene)	<1.0	12	<1.0	2	<1.0	<1	<1.0	<1.0
Tert-Butylbenzene	<1.0			<1.0	<1.4	<1.4	<1.4	<1.4
Toluene	<1.0	1.5	<1.0	2	<1.1	<1.1	0.57*	<1.1
trans-1,2-Dichloroethylene	<1.0	<1.0	<1.0	<1.0	<0.60	<0.6	<0.6	<0.6
trans-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0	<1.0	<1	<1.0	<1.0
Trichlorofluoromethane	<1.0	<1.0	<1.0	<1.0	<0.80	<0.8	<0.8	<0.8
Vinyl Acetate	<50			<5.0				
Vinyl Chloride	43	<1.0	17	12	6	4.23	1.04*	6.27
Xylene-Total	<3.0	<3.0	<3.0	<3.0				

Notes:

Only the results that are greater than the detection limit are highlighted.

* Indicates that the analytical results have been qualified by either the laboratory or by MWH as a result of data validation.

Lab: Date: Method: Units:	CT & E 5/17/95 8260 ug/L	ETOS 8/16/95 601-602 ug/L	CT & E 9/18/96 8260 ug/L	CT&E 11/12/97 8260 ug/L	Quanterra 9/14/98 8260 ug/L	JPB 7/15/00 8260 ug/L	CAS 11/13/01 8260 ug/L	CAS 5/15/02 8260 ug/L
1,1,1,2-Tetrachloroethane	<1.0		<1.0	<10*	<2.5	<5	<0.5	<0.5
1,1,1-TCA (Trichloroethane)	<1.0	<1.0	<1.0	<10*	<4.0	<8	<0.8	<0.8
1,1,2,2-Tetrachloroethane	<1.0	<1.0	<1.0	<10*	<2.5	<4	<0.4	0.18 F
1,1,2-TCA (Trichloroethane)	<1.0	<1.0	<1.0	<10*	<5.0	<10	<1.0	<1.0
1,1-DCA (Dichloroethane)	<1.0	<1.0	5	12*	<2.5	<4	12.37	2.96
1,1-DCE (Dichloroethylene)	<1.0	<1.0	<1.0	<10*	<6.0	<12	<1.2	<1.2
1,1-Dichloropropene	<1.0		<1.0	<10*	<5.0	<10	<1.0	<1.0
1,2,3-Trichlorobenzene	<1.0		1	<10*	<2.5	<3	<0.3	<0.3
1,2,3-Trichloropropane	<1.0		<1.0	<10*	<16	<32	<3.2	0.47 F
1,2,4-Trichlorobenzene	<1.0		<1.0	<10*	<2.5	<4	<0.4	<0.4
1,2,4-Trimethylbenzene	<1.0		40	100*	83	<13	23.90*	2.86
1,2-DCA (Dichloroethane)	<1.0	<1.0	<1.0	<10*	<3.0	<6	<0.6	<0.6
1,2-DCB (Dichlorobenzene)	<1.0	<1.0	<1.0	<10*	<2.5	<3	<0.3	<0.3
1,2-Dibromo-3-Chloropropane	<1.0		<1.0	<10*	<13	<26	<2.6	4.61
1,2-Dichloropropane	<1.0	<1.0	<1.0	<10*	<2.5	<4	0.13*	<0.4
1,2-EDB (Dibromoethane)	<1.0		<1.0	<10*	<3.0	<6	<0.6	0.44 F
1,3,5-Trimethylbenzene	<1.0		<1.0	<10*	20	<5	1.27	0.51
1,3-DCB (Dichlorobenzene)	<1.0	<1.0	<1.0	<10*	<6.0	<12	<1.2	<1.2
1,3-Dichloropropane					<2.5	<4	<0.4	<0.4
1,4-DCB (Dichlorobenzene)	<1.0	<1.0	<1.0	<10*	<2.5	<3	<0.3	<0.3
1-Chlorohexane					<2.5	<5	<0.5	<0.5
2,2-Dichloropropane	<1.0		<1.0	<10*	<18	<35	<3.5	<3.5
2-Butanone(MEK)	<50		<5.0	<50*				
2-Chloroethyl Vinyl Ether	<50	<10	<1.0	<50*				
2-Chlorotoluene	<1.0		<5.0	<10*	<2.5	<4	<0.4	<0.4
2-Hexanone(MBK)	<50		<5.0	<50*				
4-Chlorotoluene	<1.0		<1.0	<10*	<3.0	<6	<0.6	<0.6
4-Methyl-2-pentanone(MIBK)	<50		<1.0	<50*				
Acetone	<50		<5.0	<50*				
Acrolein	<100		<5.0	<50*				
Acrylonitrile	<100		<5.0	<50*				
Benzene	<1.0	1.4	350	1100***	310	95.7	707.0*	121.20
Bromobenzene	<1.0		<1.0	<10*	<2.5	<3	<0.3	<0.3
Bromochloromethane	<1.0		<1.0	<10*	<2.5	<4	<0.4	<0.4
Bromodichloromethane	<1.0	<1.0	<1.0	<10*	<4.0	<8	<0.8	<0.8
Bromoform	<1.0	<1.0	<1.0	<10*	<6.0	<12	<1.2	<1.2
Bromomethane	<1.0	<1.0	<1.0	<10*	<5.5	<11	0.07*	<1.1
Carbon Disulfide	<50		<1.0	<10*				
Carbon Tetrachloride	<1.0	<1.0	<1.0	<10*	<10	<21	<2.1	<2.1
Chlorobenzene	<1.0	<1.0	<1.0	<10*	<2.5	<4	0.24*	0.15 F
Chloroethane	<1.0	<1.0	<1.0	<10*	19	<10	1.09	<1.0
Chloroform	<1.0	<1.0	<1.0	<10*	3.6	<3	<0.3	<0.3
Chloromethane	<1.0	<1.0	<1.0	<10*	<6.5	<13	<1.3	<1.3
cis-1,2-Dichloroethene			<1.0	<10*	<6.0	<12	<1.2	<1.2
cis-1,3-Dichloropropene	<1.0	<1.0	<1.0	<10*	<5.0	<10	<1.0	<1.0
Dibromochloromethane	<1.0	<1.0	<1.0	<10*	<2.5	<5	<0.5	<0.5
Dibromomethane	<1.0		<1.0	<10*	<12	<24	<2.4	<2.4
Dichlorodifluoromethane	3	<1.0	<1.0	<10*	<5.0	<10	1.70*	1.22
Ethylbenzene	<1.0	<1.0	49	180*	130	<6	1.72	<0.6
Hexachlorobutadiene	<1.0		<1.0	<10*	<5.5	<11	<1.1	<1.1
Isopropyl Benzene	<1.0		<1.0	19*	15	<5	8.84	3.32
m & p Xylene	<2.0		68	360*	310	22.4	70.87*	5.44
Methylene Chloride	<1.0	<1.0	<2.0	23**	<25	<3	<0.3	<0.3
Methyl-tert-butyl Ether	<50		<1.0	<10*				
Naphthalene	<1.0		4	18*	<5.0	<4	3.03	1.26
n-Butylbenzene	<1.0		<1.0	<10*	<5.5	<11	<1.1	<1.1
n-Propyl Benzene	<1.0		4	10*	9.6	<4	4.50	0.56
o-Xylene	<1.0		<1.0	<10*	<5.5	<11	0.10*	<1.1
PCE (Tetrachloroethylene)	<1.0	<1.0	<1.0	<10*	<7.0	<14	<1.4	<1.4
p-Isopropyltoluene	<1.0		<1.0	<10*	<6.0	<12	<1.2	<1.2
sec-Butylbenzene	<1.0		<1.0	<10*	<6.5	<13	<1.3	<1.3
Styrene	<1.0		<1.0	<10*	<2.5	<4	<0.4	<0.4
TCE (Trichloroethylene)	<1.0	<1.0	<1.0	17*	<5.0	<10	<1.0	<1.0
Tert-Butylbenzene	<1.0		<1.0	<10*	8.8	<14	<1.4	<1.4
Toluene	<1.0	1.8	<1.0	<10*	<5.5	<11	<1.1	<1.1
trans-1,2-Dichloroethylene	<1.0	<1.0	<1.0	<10*	<3.0	<6	<0.6	<0.6
trans-1,3-Dichloropropene	<1.0	<1.0	<1.0	<10*	<5.0	<10	<1.0	<1.0
Trichlorofluoromethane	<1.0	<1.0	<1.0	<10*	<4.0	<8	<0.8	<0.8
Vinyl Acetate	<50		<1.0	<50*				
Vinyl Chloride	14	<1.0	<1.0	<10*	5.9	<11	10.92	4.69
Xylene-Total	<3.0	<3.0	<3.0	<30*				

Notes:

Only the results that are greater than the detection limit are highlighted.

* Indicates that the analytical results have been qualified by either the laboratory or by MWH as a result of data validation.

Lab: Date: Method: Units:	ETOS 1/23/95 601-602 ug/L	CT & E 5/17/95 8260 ug/L	CT & E 3/20/97 8260 ug/L	CT&E 11/11/97 8260 ug/L	Quanterra 9/14/98 8260 ug/L	JPB 7/17/00 8260 ug/L	CAS 10/24/01 8260 ug/L	CAS 2/13/02 8260 ug/L	CAS 5/7/02 8260 ug/L
1,1,1,2-Tetrachloroethane		<1.0	<1.0	<1.0	<5.0	<50	<0.5	<0.5	<0.5
1,1,1-TCA (Trichloroethane)	<1.0	<1.0	<1.0	<1.0	<8.0	<80	<0.8	<0.8	<0.8
1,1,2,2-Tetrachloroethane	<1.0	<1.0	<1.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
1,1,2-TCA (Trichloroethane)	<1.0	<1.0	<1.0	<1.0	<10	<100	<1.0	<1.0	<1.0
1,1-DCA (Dichloroethane)	<1.0	<1.0	<1.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
1,1-DCE (Dichloroethylene)	<1.0	<1.0	<1.0	<1.0	<12	<120	<1.2	<1.2	<1.2
1,1-Dichloropropene		<1.0	<1.0	<1.0	<10	<100	<1.0	<1.0	<1.0
1,2,3-Trichlorobenzene		<1.0	<1.0	<1.0	<5.0	<30	<0.3	<0.3	<0.3
1,2,3-Trichloropropane		<1.0	<1.0	<1.0	<32	<320	<3.2	<3.2	<3.2
1,2,4-Trichlorobenzene		<1.0	<1.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
1,2,4-Trimethylbenzene		<1.0	<1.0	<1.0	<13	<130	<1.3	0.24 F	<0.4
1,2-DCA (Dichloroethane)	<1.0	<1.0	<1.0	<1.0	<6.0	<60	<0.6	<0.6	<0.6
1,2-DCB (Dichlorobenzene)	<1.0	<1.0	<1.0	<1.0	<5.0	<30	<0.3	<0.3	<0.3
1,2-Dibromo-3-Chloropropane	<1.0	<1.0	<1.0	<1.0	<26	<260	<2.6	<2.6	<2.6
1,2-Dichloropropane	<1.0	<1.0	<1.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
1,2-EDB (Dibromoethane)		<1.0	<1.0	<1.0	<6.0	<60	<0.6	<0.6	<0.6
1,3,5-Trimethylbenzene		<1.0	<1.0	<1.0	<5.0	<50	<0.5	<0.5	<0.5
1,3-DCB (Dichlorobenzene)	<1.0	<1.0	<1.0	<1.0	<12	<120	<1.2	<1.2	<1.2
1,3-Dichloropropane					<5.0	<40	<0.4	<0.4	<0.4
1,4-DCB (Dichlorobenzene)	<1.0	<1.0	<1.0	<1.0	<5.0	<30	<0.3	<0.3	<0.3
1-Chlorohexane					<5.0	<50	<0.5	<0.5	<0.5
2,2-Dichloropropane		<1.0	<1.0	<1.0	<35	<350	<3.5	<3.5	<3.5
2-Butanone(MEK)		<50	<5.0	<5.0					
2-Chloroethyl Vinyl Ether	<10	<50	<1.0	<5.0					
2-Chlorotoluene		<1.0	<1.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
2-Hexanone(MBK)		<50	<5.0	<5.0					
4-Chlorotoluene		<1.0	<1.0	<1.0	<6.0	<60	<0.6	<0.6	<0.6
4-Methyl-2-pentanone(MIBK)		<50	<5.0	<5.0					
Acetone		<50	<5.0	<5.0					
Acrolein		<100	<5.0	<5.0					
Acrylonitrile		<100	<5.0	<5.0					
Benzene	<1.0	<1.0	<1.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
Bromobenzene		<1.0	<1.0	<1.0	<5.0	<30	<0.3	<0.3	<0.3
Bromochloromethane		<1.0	<1.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
Bromodichloromethane	<1.0	<1.0	<1.0	<1.0	<8.0	<80	<0.8	<0.8	<0.8
Bromoform	<1.0	<1.0	<1.0	<1.0	<12	<120	<1.2	<1.2	<1.2
Bromomethane	<1.0	<1.0	<1.0	<1.0	<11	<110	<1.1	<1.1	<1.1
Carbon Disulfide		<50	<1.0	<1.0					
Carbon Tetrachloride	<1.0	<1.0	<1.0	<1.0	<21	<210	<2.1	<2.1	<2.1
Chlorobenzene	<1.0	<1.0	<1.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
Chloroethane	<1.0	<1.0	<1.0	<1.0	<10	<100	<1.0	<1.0	<1.0
Chloroform	<1.0	<1.0	<1.0	<1.0	<5.0	<30	<0.3	<0.3	<0.3
Chloromethane	<1.0	<1.0	<1.0	<1.0	<13	<130	0.15*	<1.3	<1.3
cis-1,2-Dichloroethene		31	4	28	600	954	9.36	10.7 F	11.14
cis-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0	<10	<100	<1.0	<1.0	<1.0
Dibromochloromethane		<1.0	<1.0	<1.0	<5.0	<50	<0.5	<0.5	<0.5
Dibromomethane		<1.0	<1.0	<1.0	<24	<240	<2.4	<2.4	<2.4
Dichlorodifluoromethane	<1.0	<1.0	<1.0	<1.0	<10	<100	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<6.0	<60	0.11*	<0.6	<0.6
Hexachlorobutadiene		<1.0	<1.0	<1.0	<11	<110	<1.1	<1.1	<1.1
Isopropyl Benzene		<1.0	<1.0	<1.0	<5.0	<50	<0.5	<0.5	<0.5
m & p Xylene		<2.0	<2.0	<2.0	<5.0	<60	0.30*	0.56 F	<1.0
Methylene Chloride	<1.0	<1.0	<1.0	<1.0	<50	<30	<0.3	<0.3	<0.3
Methyl-tert-butyl Ether		<50	<1.0	<1.0					
Naphthalene		<1.0	<1.0	<1.0	<10	<40	<0.4	<0.4	<0.4
n-Butylbenzene		<1.0	<1.0	<1.0	<11	<110	<1.1	<1.1	<1.1
n-Propyl Benzene		<1.0	<1.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
o-Xylene		<1.0	<1.0	<1.0	<11	<110	<1.1	0.19 F	<1.1
PCE (Tetrachloroethylene)	<1.0	<1.0	<1.0	<1.0	<14	<140	<1.4	<1.4	<1.4
p-Isopropyltoluene		<1.0	<1.0	<1.0	<12	<120	<1.2	<1.2	<1.2
sec-Butylbenzene		<1.0	<1.0	<1.0	<13	<130	<1.3	<1.3	<1.3
Styrene		<1.0	<1.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
TCE (Trichloroethylene)	65	63	37	67	200	199	23.15	188.4	134.80
Tert-Butylbenzene		<1.0	<1.0	<1.0	<14	<140	<1.4	<1.4	<1.4
Toluene	<1.0	<1.0	<1.0	<1.0	<11	<110	0.79*	0.55 F	<1.1
trans-1,2-Dichloroethylene	<1.0	<1.0	<1.0	<1.0	3.7*	<60	0.22*	<0.6	<0.6
trans-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0	<10	<100	<1.0	<1.0	<1.0
Trichlorofluoromethane	<1.0	<1.0	<1.0	<1.0	<8.0	<80	<0.8	<0.8	<0.8
Vinyl Acetate		<50	<1.0	<5.0					
Vinyl Chloride	<1.0	<1.0	<1.0	<1.0	<11	<110	<1.1	<1.1	<1.1
Xylene-Total	<3.0	<3.0	<3.0	<3.0					

Notes:

Only the results that are greater than the detection limit are highlighted.

* Indicates that the analytical results have been qualified by either the laboratory or by MWH as a result of data validation.

Lab: Date: Method: Units:	ETOS 1/23/95 601-602 ug/L	CT & E 5/17/95 8260 ug/L	CT & E 3/20/97 8260 ug/L	CT&E 11/11/97 8260 ug/L	Quanterra 9/14/98 8260 ug/L	JPB 7/17/00 8260 ug/L	CAS 10/25/01 8260 ug/L	CAS 2/13/02 8260 ug/L	CAS 5/9/02 8260 ug/L
1,1,1,2-Tetrachloroethane		<1.0	<5.0	<1.0	<5.0	<50	<0.5	<0.5	<0.5
1,1,1-TCA (Trichloroethane)	<10	<1.0	<5.0	<1.0	<8.0	<80	<0.8	<0.8	<0.8
1,1,2,2-Tetrachloroethane	<10	<1.0	<5.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
1,1,2-TCA (Trichloroethane)	<10	<1.0	<5.0	<1.0	<10	<100	<1.0	<1.0	<1.0
1,1-DCA (Dichloroethane)	<10	<1.0	<5.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
1,1-DCE (Dichloroethylene)	<10	<1.0	<5.0	<1.0	<12	<120	<1.2	<1.2	<1.2
1,1-Dichloropropene		<1.0	<5.0	<1.0	<10	<100	<1.0	<1.0	<1.0
1,2,3-Trichlorobenzene		<1.0	<5.0	<1.0	<5.0	<30	<0.3	<0.3	<0.3
1,2,3-Trichloropropane		<1.0	<5.0	<1.0	<32	<320	<3.2	<3.2	<3.2
1,2,4-Trichlorobenzene		<1.0	<5.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
1,2,4-Trimethylbenzene		<1.0	<5.0	<1.0	<13	<130	<1.3	0.18 F	<1.3
1,2-DCA (Dichloroethane)	<10	<1.0	<5.0	<1.0	<6.0	<60	<0.6	<0.6	<0.6
1,2-DCB (Dichlorobenzene)	<10	<1.0	<5.0	<1.0	<5.0	<30	<0.3	<0.3	<0.3
1,2-Dibromo-3-Chloropropane	<1.0	<5.0	<1.0	<26	<260	<2.6	<2.6	<2.6	<2.6
1,2-Dichloropropane	<10	<1.0	<5.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
1,2-EDB (Dibromoethane)	<1.0	<5.0	<1.0	<6.0	<60	<0.6	<0.6	<0.6	<0.6
1,3,5-Trimethylbenzene		<1.0	<5.0	<1.0	<5.0	<50	<0.5	<0.5	<0.5
1,3-DCB (Dichlorobenzene)	<10	<1.0	<5.0	<1.0	<12	<120	<1.2	<1.2	<1.2
1,3-Dichloropropane					<5.0	<40	<0.4	<0.4	<0.4
1,4-DCB (Dichlorobenzene)	<10	<1.0	<5.0	<1.0	<5.0	<30	<0.3	<0.3	<0.3
1-Chlorohexane					<5.0	<50	<0.5	<0.5	<0.5
2,2-Dichloropropane		<1.0	<5.0	<1.0	<35	<350	<3.5	<3.5	<3.5
2-Butanone(MEK)		<50	<25	<5.0					
2-Chloroethyl Vinyl Ether	<100	<50	<5.0	<5.0					
2-Chlorotoluene		<1.0	<5.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
2-Hexanone(MBK)		<1.0	<25	<5.0					
4-Chlorotoluene		<1.0	<5.0	<1.0	<6.0	<60	<0.6	<0.6	<0.6
4-Methyl-2-pentanone(MIBK)		<50	<25	<5.0					
Acetone		<50	<5.0	<5.0					
Acrolein		<100	<25	<5.0					
Acrylonitrile		<100	<25	<5.0					
Benzene	<10	<1.0	<5.0	<1.0	<5.0	<40	<0.4	0.18 F	<0.4
Bromobenzene		<1.0	<5.0	<1.0	<5.0	<30	<0.3	<0.3	<0.3
Bromochloromethane		<1.0	<5.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
Bromodichloromethane	<10	<1.0	<5.0	<1.0	<8.0	<80	<0.8	<0.8	<0.8
Bromoform	<10	<1.0	<5.0	<1.0	<12	<120	<1.2	<1.2	<1.2
Bromomethane	<10	<1.0	<5.0	<1.0	<11	<110	<1.1	<1.1	<1.1
Carbon Disulfide		<50	<5.0	<1.0					
Carbon Tetrachloride	<10	<1.0	<5.0	<1.0	<21	<210	<2.1	<2.1	<2.1
Chlorobenzene	<10	<1.0	<5.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
Chloroethane	<10	<1.0	<5.0	<1.0	<10	<100	<1.0	<1.0	<1.0
Chloroform	<10	<1.0	<5.0	<1.0	<5.0	<30	<0.3	<0.3	<0.3
Chloromethane	<10	<1.0	<5.0	<1.0	<13	<130	<1.3	<1.3	<1.3
cis-1,2-Dichloroethene		243	270	440	520	828	62.52	21.09	76.98
cis-1,3-Dichloropropene	<10	<1.0	<5.0	<1.0	<10	<100	<1.0	<1.0	<1.0
Dibromochloromethane		<1.0	<5.0	<1.0	<5.0	<50	<0.5	<0.5	<0.5
Dibromomethane		<1.0	<5.0	<1.0	<24	<240	<2.4	<2.4	<2.4
Dichlorodifluoromethane	<10	<1.0	<5.0	<1.0	<10	<100	<1.0	<1.0	<1.0
Ethylbenzene	<10	<1.0	<5.0	<1.0	<6.0	<60	0.10*	<0.6	<0.6
Hexachlorobutadiene		<1.0	<5.0	<1.0	<11	<110	<1.1	<1.1	<1.1
Isopropyl Benzene		<1.0	<5.0	<1.0	<5.0	<50	<0.5	<0.5	<0.5
m & p Xylene		<2.0	<10	<2.0	<5.0	<60	0.24*	0.38 F	<1.0
Methylene Chloride	<10	<1.0	<5.0	<1.0	<50	<30	<0.3	<0.3	<0.3
Methyl-tert-butyl Ether		<50	<5.0	<1.0					
Naphthalene		<1.0	<5.0	<1.0	<10	<40	<0.4	<0.4	<0.4
n-Butylbenzene		<1.0	<5.0	<1.0	<11	<110	<1.1	<1.1	<1.1
n-Propyl Benzene		<1.0	<5.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
o-Xylene		<1.0	<5.0	<1.0	<11	<110	<1.1	0.14 F	<1.1
PCE (Tetrachloroethylene)	<10	<1.0	<5.0	<1.0	<14	<140	<1.4	<1.4	0.27 F
p-Isopropyltoluene		<1.0	<5.0	<1.0	<12	<120	<1.2	<1.2	<1.2
sec-Butylbenzene		<1.0	<5.0	<1.0	<13	<130	<1.3	<1.3	<1.3
Styrene		<1.0	<5.0	<1.0	<5.0	<40	<0.4	<0.4	<0.4
TCE (Trichloroethylene)	170	180	150	230	850	799	108.4	61.16	531.20
Tert-Butylbenzene		<1.0	<5.0	<1.0	<14	<140	<1.4	<1.4	<1.4
Toluene	<10	<1.0	<5.0	<1.0	<11	<110	0.82*	0.50 F	<1.1
trans-1,2-Dichloroethylene	<10	3	<5.0	3	8.0	<60	3.68	0.36 F	1.07
trans-1,3-Dichloropropene	<10	<1.0	<5.0	<1.0	<10	<100	<1.0	<1.0	<1.0
Trichlorofluoromethane	<10	<1.0	<5.0	<1.0	<8.0	<80	<0.8	<0.8	<0.8
Vinyl Acetate		<50	<5.0	<5.0					
Vinyl Chloride	<10	<1.0	<5.0	<1.0	<11	<110	<1.1	<1.1	<1.1
Xylene-Total	<30	<3.0	<15	<3.0					

Notes:

Only the results that are greater than the detection limit are highlighted.

* Indicates that the analytical results have been qualified by either the laboratory or by MWH as a result of data validation.

MW4

Volatile Organic Compounds (VOCs)

LF30/LF31

Lab:	CAS	CAS							
Date:	11/15/01	5/15/02							
Method:	8260	8260							
Units:	ug/L	ug/L							
1,1,1,2-Tetrachloroethane	<0.5	<0.5							
1,1,1-TCA (Trichloroethane)	<0.8	<0.8							
1,1,2,2-Tetrachloroethane	<0.4	<0.4							
1,1,2-TCA (Trichloroethane)	<1.0	<1.0							
1,1-DCA (Dichloroethane)	3.90*	2.13							
1,1-DCE (Dichloroethylene)	<1.2	<1.2							
1,1-Dichloropropene	<1.0	<1.0							
1,2,3-Trichlorobenzene	<0.3	<0.3							
1,2,3-Trichloropropane	<3.2	<3.2							
1,2,4-Trichlorobenzene	<0.4	<0.4							
1,2,4-Trimethylbenzene	0.54*	3.61							
1,2-DCA (Dichloroethane)	<0.6	<0.6							
1,2-DCB (Dichlorobenzene)	<0.3	<0.3							
1,2-Dibromo-3-Chloropropane	<2.6	<2.6							
1,2-Dichloropropane	0.18*	<0.4							
1,2-EDB (Dibromoethane)	<0.6	<0.6							
1,3,5-Trimethylbenzene	<0.5	0.45 F							
1,3-DCB (Dichlorobenzene)	<1.2	<1.2							
1,3-Dichloropropane	<0.4	<0.4							
1,4-DCB (Dichlorobenzene)	<0.3	<0.3							
1-Chlorohexane	<0.5	<0.5							
2,2-Dichloropropane	<3.5	<3.5							
2-Butanone(MEK)									
2-Chloroethyl Vinyl Ether									
2-Chlorotoluene	<0.4	<0.4							
2-Hexanone(MBK)									
4-Chlorotoluene	<0.6	<0.6							
4-Methyl-2-pentanone(MIBK)									
Acetone									
Acrolein									
Acrylonitrile									
Benzene	5.71*	6.21							
Bromobenzene	<0.3	<0.3							
Bromochloromethane	<0.4	<0.4							
Bromodichloromethane	<0.8	<0.8							
Bromoform	<1.2	<1.2							
Bromomethane	0.18*	<1.1							
Carbon Disulfide									
Carbon Tetrachloride	<2.1	<2.1							
Chlorobenzene	0.68*	0.49							
Chloroethane	<1.0	<1.0							
Chloroform	<0.3	<0.3							
Chloromethane	0.09*	0.62 F							
cis-1,2-Dichloroethene	<1.2	<1.2							
cis-1,3-Dichloropropene	<1.0	<1.0							
Dibromochloromethane	<0.5	<0.5							
Dibromomethane	<2.4	<2.4							
Dichlorodifluoromethane	<1.0	<1.0							
Ethylbenzene	1.78*	0.92							
Hexachlorobutadiene	<1.1	<1.1							
Isopropyl Benzene	6.47*	8.07							
m & p Xylene	15.28*	32.58							
Methylene Chloride	<0.3	<0.3							
Methyl-tert-butyl Ether									
Naphthalene	4.67*	8.48							
n-Butylbenzene	<1.1	<1.1							
n-Propyl Benzene	2.34*	5.19							
o-Xylene	<1.1	<1.1							
PCE (Tetrachloroethylene)	<1.4	<1.4							
p-Isopropyltoluene	0.16*	0.25 F							
sec-Butylbenzene	0.17*	0.42 F							
Styrene	<0.4	<0.4							
TCE (Trichloroethylene)	<1.0	<1.0							
Tert-Butylbenzene	<1.4	0.14 F							
Toluene	0.16*	<1.1							
trans-1,2-Dichloroethylene	<0.6	<0.6							
trans-1,3-Dichloropropene	<1.0	<1.0							
Trichlorofluoromethane	<0.8	<0.8							
Vinyl Acetate									
Vinyl Chloride	1.45*	0.73 F							
Xylene-Total									

Notes:

Only the results that are greater than the detection limit are highlighted.

* Indicates that the analytical results have been qualified by either the laboratory or by MWH as a result of data validation.

	Lab: Date: Method: Units:	CAS 11/14/01 8260 ug/L	CAS 2/11/02 8260 ug/L	CAS 5/15/02 8260 ug/L						
1,1,1,2-Tetrachloroethane	<0.5	<0.5	<0.5							
1,1,1-TCA (Trichloroethane)	<0.8	<0.8	<0.8							
1,1,2,2-Tetrachloroethane	<0.4	<0.4	<0.4							
1,1,2-TCA (Trichloroethane)	<1.0	<1.0	<1.0							
1,1-DCA (Dichloroethane)	<0.4	<0.4	<0.4							
1,1-DCE (Dichloroethylene)	<1.2	<1.2	<1.2							
1,1-Dichloropropene	<1.0	<1.0	<1.0							
1,2,3-Trichlorobenzene	<0.3	<0.3	<0.3							
1,2,3-Trichloropropane	<3.2	<3.2	<3.2							
1,2,4-Trichlorobenzene	<0.4	<0.4	<0.4							
1,2,4-Trimethylbenzene	<1.3	<1.3	<1.3							
1,2-DCA (Dichloroethane)	<0.6	<0.6	<0.6							
1,2-DCB (Dichlorobenzene)	<0.3	<0.3	<0.3							
1,2-Dibromo-3-Chloropropane	<2.6	<2.6	<2.6							
1,2-Dichloropropane	<0.4	<0.4	<0.4							
1,2-EDB (Dibromoethane)	<0.6	<0.6	<0.6							
1,3,5-Trimethylbenzene	<0.5	<0.5	<0.5							
1,3-DCB (Dichlorobenzene)	<1.2	<1.2	<1.2							
1,3-Dichloropropene	<0.4	<0.4	<0.4							
1,4-DCB (Dichlorobenzene)	<0.3	<0.3	<0.3							
1-Chlorohexane	<0.5	<0.5	<0.5							
2,2-Dichloropropane	<3.5	<3.5	<3.5							
2-Butanone(MEK)										
2-Chloroethyl Vinyl Ether										
2-Chlorotoluene	<0.4	<0.4	<0.4							
2-Hexanone(MBK)										
4-Chlorotoluene	<0.6	<0.6	<0.6							
4-Methyl-2-pentanone(MIBK)										
Acetone										
Acrolein										
Acrylonitrile										
Benzene	<0.4	0.23 F	<0.4							
Bromobenzene	<0.3	<0.3	<0.3							
Bromochloromethane	<0.4	<0.4	<0.4							
Bromodichloromethane	<0.8	<0.8	<0.8							
Bromoform	<1.2	<1.2	<1.2							
Bromomethane	<1.1	<1.1	<1.1							
Carbon Disulfide										
Carbon Tetrachloride	<2.1	<2.1	<2.1							
Chlorobenzene	<0.4	<0.4	<0.4							
Chloroethane	<1.0	<1.0	<1.0							
Chloroform	<0.3	<0.3	<0.3							
Chloromethane	<1.3	<1.3	<1.3							
cis-1,2-Dichloroethene	27.68	21.70	29.88							
cis-1,3-Dichloropropene	<1.0	<1.0	<1.0							
Dibromochloromethane	<0.5	<0.5	<0.5							
Dibromomethane	<2.4	<2.4	<2.4							
Dichlorodifluoromethane	<1.0	<1.0	<1.0							
Ethylbenzene	<0.6	<0.6	<0.6							
Hexachlorobutadiene	<1.1	<1.1	<1.1							
Isopropyl Benzene	<0.5	<0.5	<0.5							
m & p Xylene	<1.0	0.24 F	<1.0							
Methylene Chloride	<0.3	<0.3	<0.3							
Methyl-tert-butyl Ether										
Naphthalene	<0.4	<0.4	<0.4							
n-Butylbenzene	<1.1	<1.1	<1.1							
n-Propyl Benzene	<0.4	<0.4	<0.4							
o-Xylene	<1.1	<1.1	<1.1							
PCE (Tetrachloroethylene)	<1.4	<1.4	<1.4							
p-Isopropyltoluene	<1.2	<1.2	<1.2							
sec-Butylbenzene	<1.3	<1.3	<1.3							
Styrene	<0.4	<0.4	<0.4							
TCE (Trichloroethylene)	11.20	10.40	9.95							
Tert-Butylbenzene	<1.4	<1.4	<1.4							
Toluene	<1.1	0.48 F	<1.1							
trans-1,2-Dichloroethylene	<0.6	0.99	<0.6							
trans-1,3-Dichloropropene	<1.0	<1.0	<1.0							
Trichlorofluoromethane	<0.8	<0.8	<0.8							
Vinyl Acetate										
Vinyl Chloride	<1.1	<1.1	<1.1							
Xylene-Total										

Notes:

Only the results that are greater than the detection limit are highlighted.

Y3

Volatile Organic Compounds (VOCs)

LF30/LF31

Lab: Date: Method: Units:	CAS 4/11/01 8260 ug/L	CAS 10/26/01 8260 ug/L	CAS 2/12/02 8260 ug/L	CAS 5/14/02 8260 ug/L				
1,1,1,2-Tetrachloroethane	<0.5	<0.5	<0.5	<0.5				
1,1,1-TCA (Trichloroethane)	<0.8	<0.8	<0.8	<0.8				
1,1,2,2-Tetrachloroethane	<0.4	<0.4	<0.4	<0.4				
1,1,2-TCA (Trichloroethane)	<1.0	<1.0	<1.0	<1.0				
1,1-DCA (Dichloroethane)	6.1	7.30	2.13 F	2.14				
1,1-DCE (Dichloroethylene)	<1.2	<1.2	<1.2	<1.2				
1,1-Dichloropropene	<1.0	<1.0	<1.0	<1.0				
1,2,3-Trichlorobenzene	<0.3	<0.3	<0.3	<0.3				
1,2,3-Trichloropropane	<3.2	<3.2	<3.2	<3.2				
1,2,4-Trichlorobenzene	<0.4	<0.4	<0.4	<0.4				
1,2,4-Trimethylbenzene	110	1.33	16	7.32				
1,2-DCA (Dichloroethane)	<0.6	31.4	<0.6	<0.6				
1,2-DCB (Dichlorobenzene)	<0.3	<0.3	<0.3	<0.3				
1,2-Dibromo-3-Chloropropane	<2.6	<2.6	<2.6	<2.6				
1,2-Dichloropropane	<0.4	<0.4	<0.4	<0.4				
1,2-EDB (Dibromoethane)	<0.6	<0.6	<0.6	<0.6				
1,3,5-Trimethylbenzene	170	0.55	2.81 F	2.10				
1,3-DCB (Dichlorobenzene)	<1.2	<1.2	<1.2	<1.2				
1,3-Dichloropropene	<0.4	<0.4	<0.4	<0.4				
1,4-DCB (Dichlorobenzene)	<0.3	<0.3	<0.3	<0.3				
1-Chlorohexane	<0.5	<0.5	<0.5	<0.5				
2,2-Dichloropropane	<3.5	<3.5	<3.5	<3.5				
2-Chlorotoluene	<0.4	<0.4	<0.4	<0.4				
4-Chlorotoluene	<0.6	<0.6	<0.6	<0.6				
Benzene	370	220.10	83.00	224.90				
Bromobenzene	<0.3	<0.3	<0.3	<0.3				
Bromochloromethane	<0.4	<0.4	<0.4	<0.4				
Bromodichloromethane	<0.8	<0.8	<0.8	<0.8				
Bromoform	<1.2	<1.2	<1.2	<1.2				
Bromomethane	<1.1	<1.1	<1.1	<1.1				
Carbon Tetrachloride	<2.1	<2.1	<2.1	<2.1				
Chlorobenzene	0.18*	0.25*	<0.4	0.14 F				
Chloroethane	0.49*	<1.0	<1.0	<1.0				
Chloroform	<0.3	<0.3	<0.3	<0.3				
Chloromethane	0.32*	0.16*	<1.3	<1.3				
cis-1,2-DCE (Dichloroethylene)	<1.2	9.1	<1.2	<1.2				
cis-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0				
Dibromochloromethane	<0.5	<0.5	<0.5	<0.5				
Dibromomethane	<2.4	<2.4	<2.4	<2.4				
Dichlorodifluoromethane	<1.0	1.14	0.37 F	0.81 F				
Ethylbenzene	570	194.7	0.62	1.77				
Hexachlorobutadiene	<1.1	<1.1	<1.1	<1.1				
Isopropyl Benzene	17	8.06	3.66	9.04				
m & p Xylene	160*	72.41	59.1	266.00				
Methylene Chloride	<0.3	<0.3	<0.3	<0.3				
Naphthalene	2.1	0.47	<0.4	<0.4				
n-Butylbenzene	<1.1	<1.1	<1.1	<1.1				
n-Propylbenzene	16	4.68	1.62	6.42				
o - Xylene	0.47*	<1.1	0.18 F	<1.1				
PCE (Tetrachloroethylene)	<1.4	<1.4	<1.4	<1.4				
p-Isopropyltoluene	0.28*	0.20*	<1.2	<1.2				
sec-Butylbenzene	<1.3	<1.3	<1.3	<1.3				
Styrene	<0.4	<0.4	<0.4	<0.4				
TCE (Trichloroethylene)	<1.0	<1.0	<1.0	<1.0				
tert-Butylbenzene	0.23*	<1.4	<1.4	0.13 F				
Toluene	0.22*	0.33*	0.35 F	0.11 F				
trans-1,2-DCE (Dichloroethylene)	<0.6	<0.6	<0.6	<0.6				
trans-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0				
Trichlorofluoromethane	<0.8	<0.8	<0.8	<0.8				
Vinyl Chloride	<1.1	0.10*	<1.1	<1.1				

Notes:

Only the results that are greater than the detection limit are highlighted.

* Indicates that the analytical results have been qualified by either the laboratory or by MWH as a result of data validation.

Y4

Volatile Organic Compounds (VOCs)

LF30/LF31

	Lab: Date: Method: Units:	CAS 4/11/01 8260 ug/L	CAS 10/26/01 8260 ug/L	CAS 2/12/02 8260 ug/L	CAS 5/14/02 8260 ug/L				
1,1,1,2-Tetrachloroethane	<0.5	<0.5	<0.5	<0.5					
1,1,1-TCA (Trichloroethane)	<0.8	<0.8	<0.8	<0.8					
1,1,2,2-Tetrachloroethane	<0.4	<0.4	<0.4	<0.4					
1,1,2-TCA (Trichloroethane)	<1.0	<1.0	<1.0	<1.0					
1,1-DCA (Dichloroethane)	3.2	7.8	1.87 F	5.45					
1,1-DCE (Dichloroethylene)	<1.2	<1.2	<1.2	<1.2					
1,1-Dichloropropene	<1.0	<1.0	<1.0	<1.0					
1,2,3-Trichlorobenzene	<0.3	<0.3	<0.3	<0.3					
1,2,3-Trichloropropane	<3.2	<3.2	<3.2	<3.2					
1,2,4-Trichlorobenzene	<0.4	<0.4	<0.4	<0.4					
1,2,4-Trimethylbenzene	58	59.5	44.4	8.73					
1,2-DCA (Dichloroethane)	<0.6	<0.6	<0.6	<0.6					
1,2-DCB (Dichlorobenzene)	<0.3	<0.3	<0.3	<0.3					
1,2-Dibromo-3-Chloropropane	<2.6	<2.6	<2.6	<2.6					
1,2-Dichloropropane	<0.4	<0.4	<0.4	<0.4					
1,2-EDB (Dibromoethane)	<0.6	<0.6	<0.6	<0.6					
1,3,5-Trimethylbenzene	11	7.4	5.94	2.13					
1,3-DCB (Dichlorobenzene)	<1.2	<1.2	<1.2	<1.2					
1,3-Dichloropropane	<0.4	<0.4	<0.4	<0.4					
1,4-DCB (Dichlorobenzene)	<0.3	<0.3	<0.3	<0.3					
1-Chlorohexane	<0.5	<0.5	<0.5	<0.5					
2,2-Dichloropropane	<3.5	<3.5	<3.5	<3.5					
2-Chlorotoluene	<0.4	<0.4	<0.4	<0.4					
4-Chlorotoluene	<0.6	<0.6	<0.6	<0.6					
Benzene	180	358.9	104.40	227.90					
Bromobenzene	<0.3	<0.3	<0.3	<0.3					
Bromochloromethane	<0.4	<0.4	<0.4	<0.4					
Bromodichloromethane	<0.8	<0.8	<0.8	<0.8					
Bromoform	<1.2	<1.2	<1.2	<1.2					
Bromomethane	<1.1	<1.1	<1.1	<1.1					
Carbon Tetrachloride	<2.1	<2.1	<2.1	<2.1					
Chlorobenzene	<0.4	<0.4	<0.4	<0.4					
Chloroethane	<1.0	<1.0	<1.0	<1.0					
Chloroform	<0.3	<0.3	<0.3	<0.3					
Chloromethane	0.26*	0.32*	<1.3	<1.3					
cis-1,2-DCE (Dichloroethylene)	<1.2	<1.2	<1.2	<1.2					
cis-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0					
Dibromochloromethane	<0.5	<0.5	<0.5	<0.5					
Dibromomethane	<2.4	<2.4	<2.4	<2.4					
Dichlorodifluoromethane	<1.0	2.67	0.35 F	0.52 F					
Ethylbenzene	1.2	2.23	2.27	2.52					
Hexachlorobutadiene	<1.1	<1.1	<1.1	<1.1					
Isopropyl Benzene	8.9	6.5	10.96	13.14					
m & p Xylene	210	364.1	188.4	405.60					
Methylene Chloride	<0.3	<0.3	<0.3	<0.3					
Naphthalene	2.1	<0.4	<0.4	<0.4					
n-Butylbenzene	<1.1	<1.1	<1.1	<1.1					
n-Propylbenzene	7.3	5.66	4.41	9.20					
o - Xylene	0.20*	<1.1	0.43 F	0.17 F					
PCE (Tetrachloroethylene)	<1.4	<1.4	<1.4	<1.4					
p-Isopropyltoluene	0.28	0.35*	<1.2	<1.2					
sec-Butylbenzene	<1.3	<1.3	<1.3	<1.3					
Styrene	<0.4	<0.4	<0.4	<0.4					
TCE (Trichloroethylene)	<1.0	<1.0	<1.0	<1.0					
tert-Butylbenzene	0.13*	<1.4	0.13 F	0.21 F					
Toluene	<1.1	0.42*	0.38 F	<1.4					
trans-1,2-DCE (Dichloroethylene)	<0.6	<0.6	<0.6	<0.6					
trans-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0					
Trichlorofluoromethane	<0.8	<0.8	<0.8	<0.8					
Vinyl Chloride	<1.1	<1.1	<1.1	0.45 F					

Notes:

Only the results that are greater than the detection limit are highlighted.

* Indicates that the analytical results have been qualified by either the laboratory or by MWH as a result of data validation.

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Volatile Organic Compounds

Lab: Date: Method: Unit:	CAS 6/25/01 8260 ug/L	CAS 4/3/02 8260 ug/L	CAS 7/1/02 8260 ug/L								
1,1,1,2-Tetrachloroethane	<0.5	<2.0	<0.5								
1,1,1-Trichloroethane	<0.8	<3.2	<0.8								
1,1,2,2-Tetrachloroethane	<0.4	<1.6	<0.4								
1,1,2-Trichloroethane	<1.0	<4.0	<1.0								
1,1-Dichloroethane	<0.4	<1.6	<0.4								
1,1-Dichloroethylene	<1.2	<4.8	<1.2								
1,1-Dichloropropene	<1.0	<4.0	<1.0								
1,2,3-Trichlorobenzene	<0.3	<1.2	<0.3								
1,2,3-Trichloropropane	<3.2	<13	<3.2								
1,2,4-Trichlorobenzene	<0.4	<1.6	0.91								
1,2,4-Trimethylbenzene	79.37	156.40	176.60								
1,2-Dibromo-3-Chloropropane	<2.6	<10	<2.6								
1,2-Dibromoethane	<0.6	<2.4	<0.6								
1,2-Dichlorobenzene	<0.3	<1.2	<0.3								
1,2-Dichloroethane	<0.6	<2.4	<0.6								
1,2-Dichloropropane	<0.4	<1.6	<0.4								
1,3,5-Trimethylbenzene	27.67	42.78	29.54								
1,3-Dichlorobenzene	<1.2	<4.8	<1.2								
1,3-Dichloropropane	<0.4	<1.6	<0.4								
1,4-Dichlorobenzene	<0.3	<1.2	<0.3								
1-Chlorohexane	<0.5	<2.0	<0.5								
2,2-Dichloropropane	<3.5	<14	<3.5								
2-Butanone(MEK)											
2-Chloroethyl Vinyl Ether											
2-Chlorotoluene	<0.4	<1.6	<0.4								
2-Hexanone(MBK)											
4-Chlorotoluene	<0.6	<2.4	<0.6								
4-Methyl-2-pentanone(MIBK)											
Acetone											
Acrolein											
Acrylonitrile											
Benzene	85.50	21.70	56.19								
Bromobenzene	<0.3	<1.2	<0.3								
Bromochloromethane	<0.4	<1.6	<0.4								
Bromodichloromethane	<0.8	<3.2	<0.8								
Bromoform	<1.2	<4.8	<1.2								
Bromomethane	<1.1	<4.4	<1.1								
c-1,2-Dichloroethene	<1.2	<4.8	<1.2								
c-1,3-Dichloropropene	<1.0	<4.0	<1.0								
Carbon Disulfide											
Carbon Tetrachloride	<2.1	<8.4	<2.1								
Chlorobenzene	<0.4	<1.6	<0.4								
Chloroethane	<1.0	<4.0	<1.0								
Chloroform	<0.3	0.80 F	<0.3								
Chloromethane	0.28 F	1.49 F	<1.3								
Dibromochloromethane	<0.5	<2.0	<0.5								
Dibromomethane	<2.4	<9.6	<2.4								
Dichlorodifluoromethane	<1.0	<4.0	<1.0								
Ethylbenzene	80.14	245.2	197.20								
Hexachlorobutadiene	<1.1	<4.4	<1.1								
Isopropyl Benzene	30.11	27.23	20.61								
m,p-Xylene	203.60	601.7	553.60								
Methylene Chloride	<0.3	<1.2	<0.3								
Methyl-tert-butyl Ether											
Naphthalene	18.71	17.84	19.76								
n-Butylbenzene	<1.1	<4.4	<1.1								
n-Propyl Benzene	27.19	25.01	18.47								
o Xylene	0.72 F	1.32 F	1.29								
p-Isopropyltoluene	3.25	5.56	2.73								
sec-Butylbenzene	2.88	2.55 F	2.02								
Styrene	<0.4	<1.6	<0.4								
t-1,2-Dichloroethylene	<0.6	<2.4	<0.6								
t-1,3-Dichloropropene	<1.0	<4.0	<1.0								
t-Butylbenzene	<1.4	<5.6	0.34 F								
Tetrachloroethylene	<1.4	<5.6	<1.4								
Toluene	<1.1	<4.4	1.27								
Trichloroethylene	0.44 F	<4.0	<1.0								
Trichlorofluoromethane	<0.8	<3.2	<0.8								
Vinyl Acetate											
Vinyl Chloride	<1.1	<4.4	<1.1								

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Volatile Organic Compounds

Lab: Date: Method: Unit:	CAS 6/25/01 8260 ug/L	CAS 4/4/02 8260 ug/L	CAS 7/2/02 8260 ug/L								
1,1,1,2-Tetrachloroethane	<0.5	<0.5	<0.5								
1,1,1-Trichloroethane	<0.8	<0.8	<0.8								
1,1,2,2-Tetrachloroethane	<0.4	<0.4	<0.4								
1,1,2-Trichloroethane	<1.0	<1.0	<1.0								
1,1-Dichloroethane	<0.4	<0.4	<0.4								
1,1-Dichloroethylene	<1.2	<1.2	<1.2								
1,1-Dichloropropene	<1.0	<1.0	<1.0								
1,2,3-Trichlorobenzene	<0.3	<0.3	<0.3								
1,2,3-Trichloropropane	<3.2	<3.2	<3.2								
1,2,4-Trichlorobenzene	<0.4	<0.4	<0.4								
1,2,4-Trimethylbenzene	19.55	<1.3	<1.3								
1,2-Dibromo-3-Chloropropane	<2.6	<2.6	<2.6								
1,2-Dibromoethane	<0.6	<0.6	<0.6								
1,2-Dichlorobenzene	<0.3	<0.3	<0.3								
1,2-Dichloroethane	<0.6	<0.6	<0.6								
1,2-Dichloropropane	<0.4	<0.4	<0.4								
1,3,5-Trimethylbenzene	2.64	<0.5	<0.5								
1,3-Dichlorobenzene	<1.2	<1.2	<1.2								
1,3-Dichloropropene	<0.4	<0.4	<0.4								
1,4-Dichlorobenzene	<0.3	<0.3	<0.3								
1-Chlorohexane	<0.5	<0.5	<0.5								
2,2-Dichloropropane	<3.5	<3.5	<3.5								
2-Butanone(MEK)											
2-Chloroethyl Vinyl Ether											
2-Chlorotoluene	<0.4	<0.4	<0.4								
2-Hexanone(MBK)											
4-Chlorotoluene	<0.6	<0.6	<0.6								
4-Methyl-2-pentanone(MIBK)											
Acetone											
Acrolein											
Acrylonitrile											
Benzene	2.03	2.10	<0.4								
Bromobenzene	<0.3	<0.3	<0.3								
Bromochloromethane	<0.4	<0.4	<0.4								
Bromodichloromethane	<0.8	<0.8	<0.8								
Bromoform	<1.2	<1.2	<1.2								
Bromomethane	<1.1	<1.1	<1.1								
c-1,2-Dichloroethene	<1.2	<1.2	<1.2								
c-1,3-Dichloropropene	<1.0	<1.0	<1.0								
Carbon Disulfide											
Carbon Tetrachloride	<2.1	<2.1	<2.1								
Chlorobenzene	<0.4	<0.4	<0.4								
Chloroethane	<1.0	<1.0	<1.0								
Chloroform	<0.3	<0.3	<0.3								
Chloromethane	0.62 F	0.24 F	0.34 F								
Dibromochloromethane	<0.5	<0.5	<0.5								
Dibromomethane	<2.4	<2.4	<2.4								
Dichlorodifluoromethane	<1.0	<1.0	<1.0								
Ethylbenzene	37.75	0.34 F	<0.6								
Hexachlorobutadiene	<1.1	<1.1	<1.1								
Isopropyl Benzene	13.46	3.2	1.40								
m,p-Xylene	68.85	0.79 F	<1.0								
Methylene Chloride	0.12 F	<0.3	<0.3								
Methyl-tert-butyl Ether											
Naphthalene	10.48	2.40	<0.4								
n-Butylbenzene	<1.1	<1.1	<1.1								
n-Propyl Benzene	6.46	0.43	<0.4								
o Xylene	<1.1	<1.1	<1.1								
p-Isopropyltoluene	0.67 F	0.28 F	<1.2								
sec-Butylbenzene	1.89	0.47 F	0.24 F								
Styrene	<0.4	<0.4	<0.4								
t-1,2-Dichloroethylene	<0.6	<0.6	<0.6								
t-1,3-Dichloropropene	<1.0	<1.0	<1.0								
t-Butylbenzene	0.33 F	<1.4	<1.4								
Tetrachloroethylene	<1.4	<1.4	<1.4								
Toluene	<1.1	<1.1	<1.1								
Trichloroethylene	<1.0	<1.0	<1.0								
Trichlorofluoromethane	<0.8	<0.8	<0.8								
Vinyl Acetate											
Vinyl Chloride	<1.1	<1.1	<1.1								

H83D
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Volatile Organic Compounds

Lab: Date: Method: Unit:	CAS 6/25/01 8260 ug/L	CAS 4/4/02 8260 ug/L	CAS 7/2/02 8260 ug/L								
1,1,1,2-Tetrachloroethane	<0.5	<0.5	<0.5								
1,1,1-Trichloroethane	<0.8	<0.8	<0.8								
1,1,2,2-Tetrachloroethane	<0.4	<0.4	<0.4								
1,1,2-Trichloroethane	<1.0	<1.0	<1.0								
1,1-Dichloroethane	<0.4	<0.4	<0.4								
1,1-Dichloroethylene	<1.2	<1.2	<1.2								
1,1-Dichloropropene	<1.0	<1.0	<1.0								
1,2,3-Trichlorobenzene	<0.3	<0.3	<0.3								
1,2,3-Trichloropropane	<3.2	<3.2	<3.2								
1,2,4-Trichlorobenzene	<0.4	<0.4	<0.4								
1,2,4-Trimethylbenzene	0.15 F	<1.3	<1.3								
1,2-Dibromo-3-Chloropropane	<2.6	<2.6	<2.6								
1,2-Dibromoethane	<0.6	<0.6	<0.6								
1,2-Dichlorobenzene	<0.3	<0.3	<0.3								
1,2-Dichloroethane	<0.6	<0.6	<0.6								
1,2-Dichloropropane	<0.4	<0.4	<0.4								
1,3,5-Trimethylbenzene	<0.5	<0.5	<0.5								
1,3-Dichlorobenzene	<1.2	<1.2	<1.2								
1,3-Dichloropropene	<0.4	<0.4	<0.4								
1,4-Dichlorobenzene	<0.3	<0.3	<0.3								
1-Chlorohexane	<0.5	<0.5	<0.5								
2,2-Dichloropropane	<3.5	<3.5	<3.5								
2-Butanone(MEK)											
2-Chloroethyl Vinyl Ether											
2-Chlorotoluene	<0.4	<0.4	<0.4								
2-Hexanone(MBK)											
4-Chlorotoluene	<0.6	<0.6	<0.6								
4-Methyl-2-pentanone(MIBK)											
Acetone											
Acrolein											
Acrylonitrile											
Benzene	<0.4	<0.4	<0.4								
Bromobenzene	<0.3	<0.3	<0.3								
Bromochloromethane	<0.4	<0.4	<0.4								
Bromodichloromethane	<0.8	<0.8	<0.8								
Bromoform	<1.2	<1.2	<1.2								
Bromomethane	<1.1	<1.1	<1.1								
c-1,2-Dichloroethene	0.10 F	<1.2	<1.2								
c-1,3-Dichloropropene	<1.0	<1.0	<1.0								
Carbon Disulfide											
Carbon Tetrachloride	<2.1	<2.1	<2.1								
Chlorobenzene	<0.4	<0.4	<0.4								
Chloroethane	<1.0	<1.0	<1.0								
Chloroform	<0.3	<0.3	<0.3								
Chloromethane	0.60 F	<1.3	0.33 F								
Dibromochloromethane	<0.5	<0.5	<0.5								
Dibromomethane	<2.4	<2.4	<2.4								
Dichlorodifluoromethane	<1.0	<1.0	<1.0								
Ethylbenzene	0.29 F	<0.6	<0.6								
Hexachlorobutadiene	<1.1	<1.1	<1.1								
Isopropyl Benzene	0.11 F	<0.5	<0.5								
m,p-Xylene	0.54 F	<1.0	<1.0								
Methylene Chloride	<0.3	<0.3	<0.3								
Methyl-tert-butyl Ether											
Naphthalene	0.21 F	<0.4	<0.4								
n-Butylbenzene	<1.1	<1.1	<1.1								
n-Propyl Benzene	<0.4	<0.4	<0.4								
o Xylene	<1.1	<1.1	<1.1								
p-Isopropyltoluene	<1.2	<1.2	<1.2								
sec-Butylbenzene	<1.3	<1.3	<1.3								
Styrene	<0.4	<0.4	<0.4								
t-1,2-Dichloroethylene	<0.6	<0.6	<0.6								
t-1,3-Dichloropropene	<1.0	<1.0	<1.0								
t-Butylbenzene	<1.4	<1.4	<1.4								
Tetrachloroethylene	<1.4	<1.4	<1.4								
Toluene	<1.1	<1.1	<1.1								
Trichloroethylene	1.07	0.76 F	0.64 F								
Trichlorofluoromethane	<0.8	<0.8	<0.8								
Vinyl Acetate											
Vinyl Chloride	<1.1	<1.1	<1.1								

MW4S
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Volatile Organic Compounds

Lab: Date: Method: Unit:	CAS 6/25/01 8260 ug/L	CAS 4/4/02 8260 ug/L	CAS 7/2/02 8260 ug/L								
1,1,1,2-Tetrachloroethane	0.81 M	<13	<5.0								
1,1,1-Trichloroethane	0.80 M	<20	<8.0								
1,1,2,2-Tetrachloroethane	<4.0	<10	<4.0								
1,1,2-Trichloroethane	<10	<25	<10.0								
1,1-Dichloroethane	<4.0	<10	<4.0								
1,1-Dichloroethylene	<12	<30	<12.0								
1,1-Dichloropropene	<10	<25	<10.0								
1,2,3-Trichlorobenzene	0.97 M	<7.5	<3.0								
1,2,3-Trichloropropane	<32	<80	<32.0								
1,2,4-Trichlorobenzene	0.88 M	<10	<4.0								
1,2,4-Trimethylbenzene	733.7 M	780.0	599.70								
1,2-Dibromo-3-Chloropropane	<26	<65	<26								
1,2-Dibromoethane	<6.0	<15	<6.0								
1,2-Dichlorobenzene	0.71 M	<7.5	<3.0								
1,2-Dichloroethane	<6.0	<15	<6.0								
1,2-Dichloropropane	<4.0	<10	<4.0								
1,3,5-Trimethylbenzene	248.7 M	200.0	152.50								
1,3-Dichlorobenzene	1.4 M	<30	<12.0								
1,3-Dichloropropane	<4.0	<10	<4.0								
1,4-Dichlorobenzene	1.18 M	<7.5	<3.0								
1-Chlorohexane	2.45 M	<13	<5.0								
2,2-Dichloropropane	0.9 M	<88	<35.0								
2-Butanone(MEK)											
2-Chloroethyl Vinyl Ether											
2-Chlorotoluene	0.68 M	<10	<4.0								
2-Hexanone(MBK)											
4-Chlorotoluene	0.58 M	<15	<6.0								
4-Methyl-2-pentanone(MIBK)											
Acetone											
Acrolein											
Acrylonitrile											
Benzene	248.3 M	130.0	188.40								
Bromobenzene	<3.0	<7.5	<3.0								
Bromochloromethane	<4.0	<10	<4.0								
Bromodichloromethane	<8.0	<20	<8.0								
Bromoform	<12	<30	<12.0								
Bromomethane	<11	<28	<11.0								
c-1,2-Dichloroethene	<12	<30	<12.0								
c-1,3-Dichloropropene	<10	<25	<10.0								
Carbon Disulfide											
Carbon Tetrachloride	<21	<53	<21.0								
Chlorobenzene	<4.0	<10	<4.0								
Chloroethane	<10	<25	<10								
Chloroform	1.01 M	<7.5	<3.0								
Chloromethane	<13	<33	<13								
Dibromochloromethane	<5.0	<13	<5.0								
Dibromomethane	<24	<60	<24								
Dichlorodifluoromethane	<10	<25	<10								
Ethylbenzene	713.50 M	1200.0	1115.00								
Hexachlorobutadiene	1.3 M	<28	<11.0								
Isopropyl Benzene	98.48 M	92.0	85.92								
m,p-Xylene	1849.0 M	3600.0	3098.00								
Methylene Chloride	<3.0	<7.5	<3.0								
Methyl-tert-butyl Ether											
Naphthalene	342.40 M	230.0	185.70								
n-Butylbenzene	44.3 M	22.0 F	9.31 F								
n-Propyl Benzene	147.80 M	110.0	117.30								
o Xylene	2.5 F	<28	2.09 F								
p-Isopropyltoluene	28.6 M	13.0 F	9.34 F								
sec-Butylbenzene	23.4 M	12.0 F	9.88 F								
Styrene	<4.0	<10	<4.0								
t-1,2-Dichloroethylene	<6.0	<15	<6.0								
t-1,3-Dichloropropene	<10	<25	<10.0								
t-Butylbenzene	1.9 M	<35	<14.0								
Tetrachloroethylene	1.0 M	<35	<14.0								
Toluene	<11	<28	<11.0								
Trichloroethylene	<10	<25	<10.0								
Trichlorofluoromethane	<8.0	<20	<8.0								
Vinyl Acetate											
Vinyl Chloride	<11	<28	<11.0								

Volatile Organic Compounds

Lab: Date: Method: Unit:	CAS 6/25/01 8260 ug/L	CAS 4/8/02 8260 ug/L	CAS 7/1/02 8260 ug/L								
1,1,1,2-Tetrachloroethane	<0.5	<0.5	<0.5								
1,1,1-Trichloroethane	<0.8	<0.8	<0.8								
1,1,2,2-Tetrachloroethane	<0.4	<0.4	<0.4								
1,1,2-Trichloroethane	<1.0	<1.0	<1.0								
1,1-Dichloroethane	<0.4	<0.4	<0.4								
1,1-Dichloroethylene	<1.2	<1.2	<1.2								
1,1-Dichloropropene	<1.0	<1.0	<1.0								
1,2,3-Trichlorobenzene	<0.3	<0.3	<0.3								
1,2,3-Trichloropropane	<3.2	<3.2	<3.2								
1,2,4-Trichlorobenzene	<0.4	<0.4	<0.4								
1,2,4-Trimethylbenzene	<1.3	<1.3	<1.3								
1,2-Dibromo-3-Chloropropane	<2.6	<2.6	<2.6								
1,2-Dibromoethane	<0.6	<0.6	<0.6								
1,2-Dichlorobenzene	<0.3	<0.3	<0.3								
1,2-Dichloroethane	<0.6	<0.6	<0.6								
1,2-Dichloropropane	<0.4	<0.4	<0.4								
1,3,5-Trimethylbenzene	<0.5	<0.5	<0.5								
1,3-Dichlorobenzene	<1.2	<1.2	<1.2								
1,3-Dichloropropene	<0.4	<0.4	<0.4								
1,4-Dichlorobenzene	<0.3	<0.3	<0.3								
1-Chlorohexane	<0.5	<0.5	<0.5								
2,2-Dichloropropane	<3.5	<3.5	<3.5								
2-Butanone(MEK)											
2-Chloroethyl Vinyl Ether											
2-Chlorotoluene	<0.4	<0.4	<0.4								
2-Hexanone(MBK)											
4-Chlorotoluene	<0.6	<0.6	<0.6								
4-Methyl-2-pentanone(MIBK)											
Acetone											
Acrolein											
Acrylonitrile											
Benzene	<0.4	<0.4	<0.4								
Bromobenzene	<0.3	<0.3	<0.3								
Bromochloromethane	<0.4	<0.4	<0.4								
Bromodichloromethane	<0.8	<0.8	<0.8								
Bromoform	<1.2	<1.2	<1.2								
Bromomethane	<1.1	<1.1	<1.1								
c-1,2-Dichloroethene	<1.2	<1.2	<1.2								
c-1,3-Dichloropropene	<1.0	<1.0	<1.0								
Carbon Disulfide											
Carbon Tetrachloride	<2.1	<2.1	<2.1								
Chlorobenzene	<0.4	<0.4	<0.4								
Chloroethane	<1.0	<1.0	<1.0								
Chloroform	<0.3	<0.3	<0.3								
Chloromethane	<1.3	<1.3	<1.3								
Dibromochloromethane	<0.5	<0.5	<0.5								
Dibromomethane	<2.4	<2.4	<2.4								
Dichlorodifluoromethane	<1.0	<1.0	<1.0								
Ethylbenzene	<0.6	0.66	<0.6								
Hexachlorobutadiene	<1.1	<1.1	<1.1								
Isopropyl Benzene	<0.5	<0.5	<0.5								
m,p-Xylene	<1.0	1.68	<1.0								
Methylene Chloride	<0.3	<0.3	<0.3								
Methyl-tert-butyl Ether											
Naphthalene	<0.4	<0.4	<0.4								
n-Butylbenzene	<1.1	<1.1	<1.1								
n-Propyl Benzene	<0.4	<0.4	<0.4								
o Xylene	<1.1	<1.1	<1.1								
p-Isopropyltoluene	<1.2	<1.2	<1.2								
sec-Butylbenzene	<1.3	<1.3	<1.3								
Styrene	<0.4	<0.4	<0.4								
t-1,2-Dichloroethylene	<0.6	<0.6	<0.6								
t-1,3-Dichloropropene	<1.0	<1.0	<1.0								
t-Butylbenzene	<1.4	<1.4	<1.4								
Tetrachloroethylene	<1.4	<1.4	<1.4								
Toluene	<1.1	<1.1	<1.1								
Trichloroethylene	2.74	1.38	1.39								
Trichlorofluoromethane	<0.8	<0.8	<0.8								
Vinyl Acetate											
Vinyl Chloride	<1.1	<1.1	<1.1								

Volatile Organic Compounds

Lab: Date: Method: Unit:	CAS 6/25/01 8260 ug/L	CAS 4/3/02 8260 ug/L	CAS 7/1/02 8260 ug/L								
1,1,1,2-Tetrachloroethane	<5.0	<10	<5.0								
1,1,1-Trichloroethane	<8.0	<16	<8.0								
1,1,2,2-Tetrachloroethane	<4.0	<8.0	<4.0								
1,1,2-Trichloroethane	<10	<20	<10								
1,1-Dichloroethane	<4.0	<8.0	<4.0								
1,1-Dichloroethylene	<12	<24	<12								
1,1-Dichloropropene	<10	<20	<10								
1,2,3-Trichlorobenzene	<3.0	<6.0	<3.0								
1,2,3-Trichloropropane	<32	<64	<32								
1,2,4-Trichlorobenzene	<4.0	<8.0	<4.0								
1,2,4-Trimethylbenzene	581.0	657.1	562.70								
1,2-Dibromo-3-Chloropropane	<26	<52	<26								
1,2-Dibromoethane	<6.0	<12	<6.0								
1,2-Dichlorobenzene	<3.0	<6.0	<3.0								
1,2-Dichloroethane	<6.0	<12	<6.0								
1,2-Dichloropropane	<4.0	<8.0	<4.0								
1,3,5-Trimethylbenzene	178.40	163.9	120.90								
1,3-Dichlorobenzene	<12	<24	<12								
1,3-Dichloropropane	<4.0	<8.0	<4.0								
1,4-Dichlorobenzene	<3.0	<6.0	<3.0								
1-Chlorohexane	<5.0	<10	<5.0								
2,2-Dichloropropane	<35	<70	<35								
2-Butanone(MEK)											
2-Chloroethyl Vinyl Ether											
2-Chlorotoluene	<4.0	<8.0	<4.0								
2-Hexanone(MBK)											
4-Chlorotoluene	<6.0	<12	<6.0								
4-Methyl-2-pentanone(MIBK)											
Acetone											
Acrolein											
Acrylonitrile											
Benzene	307.60	285.40	219.20								
Bromobenzene	<3.0	<6.0	<3.0								
Bromochloromethane	<4.0	<8.0	<4.0								
Bromodichloromethane	<8.0	<16	<8.0								
Bromoform	<12	<24	<12								
Bromomethane	<11	<22	<11								
c-1,2-Dichloroethene	<12	<24	<12								
c-1,3-Dichloropropene	<10	<20	<10								
Carbon Disulfide											
Carbon Tetrachloride	<21	<42	<21								
Chlorobenzene	<4.0	<8.0	<4.0								
Chloroethane	<10	<20	<10								
Chloroform	<3.0	4.92 F	<3.0								
Chloromethane	<13	<26	<13								
Dibromochloromethane	<5.0	<10	<5.0								
Dibromomethane	<24	<48	<24								
Dichlorodifluoromethane	<10	<20	<10								
Ethylbenzene	676.20	926.30	838.00								
Hexachlorobutadiene	<11	<22	<11								
Isopropyl Benzene	80.93	70.3	54.97								
m,p-Xylene	1741.0	2802.0	2406.00								
Methylene Chloride	<3.0	3.47 F	<3.0								
Methyl-tert-butyl Ether											
Naphthalene	193.10	192.70	132.40								
n-Butylbenzene	19.4	<22	7.32 F								
n-Propyl Benzene	110.10	90.43	72.16								
o Xylene	3.7 F	<22	1.81 F								
p-Isopropyltoluene	14.4	17.8 F	7.66 F								
sec-Butylbenzene	12.2 F	10.5 F	7.29 F								
Styrene	<4.0	<8.0	<4.0								
t-1,2-Dichloroethylene	<6.0	<12	<6.0								
t-1,3-Dichloropropene	<10	<20	<10								
tert-Butylbenzene	1.2 F	<28	<14.0								
Tetrachloroethylene	<14	<28	<14								
Toluene	<11	<22	<11								
Trichloroethylene	<10	<20	<10								
Trichlorofluoromethane	<8.0	<16	<8.0								
Vinyl Acetate											
Vinyl Chloride	<11	<22	<11								

Volatile Organic Compounds

Lab: Date: Method: Unit:	CAS 6/25/01 8260 ug/L	CAS 4/3/02 8260 ug/L	CAS 7/1/02 8260 ug/L								
1,1,1,2-Tetrachloroethane	<0.5	<0.5	<0.5								
1,1,1-Trichloroethane	<0.8	<0.8	<0.8								
1,1,2,2-Tetrachloroethane	<0.4	<0.4	<0.4								
1,1,2-Trichloroethane	<1.0	<1.0	<1.0								
1,1-Dichloroethane	<0.4	<0.4	<0.4								
1,1-Dichloroethylene	<1.2	<1.2	<1.2								
1,1-Dichloropropene	<1.0	<1.0	<1.0								
1,2,3-Trichlorobenzene	<0.3	<0.3	<0.3								
1,2,3-Trichloropropane	<3.2	<3.2	<3.2								
1,2,4-Trichlorobenzene	<0.4	<0.4	<0.4								
1,2,4-Trimethylbenzene	2.42	0.94 F	<1.3								
1,2-Dibromo-3-Chloropropane	<2.6	<2.6	<2.6								
1,2-Dibromoethane	<0.6	<0.6	<0.6								
1,2-Dichlorobenzene	<0.3	<0.3	<0.3								
1,2-Dichloroethane	<0.6	<0.6	<0.6								
1,2-Dichloropropane	<0.4	<0.4	<0.4								
1,3,5-Trimethylbenzene	0.64	0.23 F	<0.5								
1,3-Dichlorobenzene	<1.2	<1.2	<1.2								
1,3-Dichloropropene	<0.4	<0.4	<0.4								
1,4-Dichlorobenzene	<0.3	<0.3	<0.3								
1-Chlorohexane	<0.5	<0.5	<0.5								
2,2-Dichloropropane	<3.5	<3.5	<3.5								
2-Butanone(MEK)											
2-Chloroethyl Vinyl Ether											
2-Chlorotoluene	<0.4	<0.4	<0.4								
2-Hexanone(MBK)											
4-Chlorotoluene	<0.6	<0.6	<0.6								
4-Methyl-2-pentanone(MIBK)											
Acetone											
Acrolein											
Acrylonitrile											
Benzene	0.92	0.44	<0.4								
Bromobenzene	<0.3	<0.3	<0.3								
Bromochloromethane	<0.4	<0.4	<0.4								
Bromodichloromethane	<0.8	<0.8	<0.8								
Bromoform	<1.2	<1.2	<1.2								
Bromomethane	<1.1	<1.1	<1.1								
c-1,2-Dichloroethene	<1.2	<1.2	<1.2								
c-1,3-Dichloropropene	<1.0	<1.0	<1.0								
Carbon Disulfide											
Carbon Tetrachloride	<2.1	<2.1	<2.1								
Chlorobenzene	<0.4	<0.4	<0.4								
Chloroethane	<1.0	<1.0	<1.0								
Chloroform	<0.3	<0.3	<0.3								
Chloromethane	0.14 F	<1.0	0.39 F								
Dibromochloromethane	<0.5	<0.5	<0.5								
Dibromomethane	<2.4	<2.4	<2.4								
Dichlorodifluoromethane	<1.0	0.26 M	<1.0								
Ethylbenzene	4.71	2.14	<0.6								
Hexachlorobutadiene	<1.1	<1.1	<1.1								
Isopropyl Benzene	0.29 F	<0.5	<0.5								
m,p-Xylene	12.75	6.44 M	<1.0								
Methylene Chloride	<0.3	<0.3	<0.3								
Methyl-tert-butyl Ether											
Naphthalene	0.59	0.22 F	<0.4								
n-Butylbenzene	<1.1	<1.1	<1.1								
n-Propyl Benzene	0.35 F	0.30 F	<0.4								
o Xylene	<1.1	<1.1	<1.1								
p-Isopropyltoluene	<1.2	<1.2	<1.2								
sec-Butylbenzene	<1.3	<1.3	<1.3								
Styrene	<0.4	<0.4	<0.4								
t-1,2-Dichloroethylene	<0.6	<0.6	<0.6								
t-1,3-Dichloropropene	<1.0	<1.0	<1.0								
t-Butylbenzene	<1.4	<1.4	<1.4								
Tetrachloroethylene	<1.4	<1.4	<1.4								
Toluene	<1.1	<1.1	<1.1								
Trichloroethylene	<1.0	<1.0	<1.0								
Trichlorofluoromethane	<0.8	<0.8	<0.8								
Vinyl Acetate											
Vinyl Chloride	<1.1	<1.1	<1.1								

Volatile Organic Compounds

Lab: Date: Method: Unit:	CAS 6/25/01 8260 ug/L	CAS 4/4/02 8260 ug/L	CAS 7/2/02 8260 ug/L								
1,1,1,2-Tetrachloroethane	<0.5	<0.5	<2.5								
1,1,1-Trichloroethane	<0.8	<0.8	<4.0								
1,1,2,2-Tetrachloroethane	<0.4	<0.4	<2.0								
1,1,2-Trichloroethane	<1.0	<1.0	<5.0								
1,1-Dichloroethane	<0.4	<0.4	<2.0								
1,1-Dichloroethylene	<1.2	<1.2	<6.0								
1,1-Dichloropropene	<1.0	<1.0	<5.0								
1,2,3-Trichlorobenzene	<0.3	<0.3	<1.5								
1,2,3-Trichloropropane	<3.2	<3.2	<16.0								
1,2,4-Trichlorobenzene	<0.4	<0.4	<2.0								
1,2,4-Trimethylbenzene	108.20	610.0	521.30								
1,2-Dibromo-3-Chloropropane	<2.6	<2.6	<13.0								
1,2-Dibromoethane	<0.6	<0.6	<3.0								
1,2-Dichlorobenzene	<0.3	<0.3	<1.5								
1,2-Dichloroethane	<0.6	<0.6	<3.0								
1,2-Dichloropropane	<0.4	<0.4	<2.0								
1,3,5-Trimethylbenzene	80.79	130.00	87.54								
1,3-Dichlorobenzene	<1.2	<1.2	<6.0								
1,3-Dichloropropane	<0.4	<0.4	<2.0								
1,4-Dichlorobenzene	<0.3	<0.3	<1.5								
1-Chlorohexane	<0.5	<0.5	<2.5								
2,2-Dichloropropane	<3.5	<3.5	<17.5								
2-Butanone(MEK)											
2-Chloroethyl Vinyl Ether											
2-Chlorotoluene	<0.4	<0.4	<2.0								
2-Hexanone(MBK)											
4-Chlorotoluene	<0.6	<0.6	<3.0								
4-Methyl-2-pentanone(MIBK)											
Acetone											
Acrolein											
Acrylonitrile											
Benzene	<0.4	<0.4	<2.0								
Bromobenzene	<0.3	<0.3	<1.5								
Bromochloromethane	<0.4	<0.4	<2.0								
Bromodichloromethane	<0.8	<0.8	<4.0								
Bromoform	<1.2	<1.2	<6.0								
Bromomethane	<1.1	4.0 F	<5.5								
c-1,2-Dichloroethene	<1.2	<1.2	<6.0								
c-1,3-Dichloropropene	<1.0	<1.0	<5.0								
Carbon Disulfide											
Carbon Tetrachloride	<2.1	<2.1	<10.5								
Chlorobenzene	<0.4	<0.4	<2.0								
Chloroethane	<1.0	<1.0	<5.0								
Chloroform	<0.3	<0.3	<1.5								
Chloromethane	<1.3	2.3 F	<6.5								
Dibromochloromethane	<0.5	<0.5	<2.5								
Dibromomethane	<2.4	<2.4	<12.0								
Dichlorodifluoromethane	<1.0	<1.0	<5.0								
Ethylbenzene	95.82	360.00	368.50								
Hexachlorobutadiene	<1.1	<1.1	<5.5								
Isopropyl Benzene	57.76	48.00	58.93								
m,p-Xylene	278.20	1400.0	1294.00								
Methylene Chloride	<0.3	<0.3	<1.5								
Methyl-tert-butyl Ether											
Naphthalene	96.19	100.00	83.51								
n-Butylbenzene	17.87	17.87	6.58								
n-Propyl Benzene	74.61	60.00	79.58								
o Xylene	175.40	220.0	232.00								
p-Isopropyltoluene	15.14	12.0	9.50								
sec-Butylbenzene	11.5	8.4 F	9.38								
Styrene	<0.4	<0.4	<2.0								
t-1,2-Dichloroethylene	<0.6	<0.6	<3.0								
t-1,3-Dichloropropene	<1.0	<1.0	<5.0								
tert-Butylbenzene	1.22 F	<1.4	0.72 F								
Tetrachloroethylene	<1.4	<1.4	<7.0								
Toluene	2.06	<1.1	1.00 F								
Trichloroethylene	<1.0	<1.0	<5.0								
Trichlorofluoromethane	<0.8	<0.8	<4.0								
Vinyl Acetate											
Vinyl Chloride	<1.1	<1.1	<5.5								

H89S
SS08

Volatile Organic Compounds

Lab:	JPB	JPB	CAS	CAS	CAS	CAS	CAS
Date:	7/20/99	7/31/00	6/13/01	10/15/01	1/3/02	4/2/02	7/8/02
Method:	8260	8260	8260	8260	8260	8260	8260
Unit:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
1,1,1,2-Tetrachloroethane	<1.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	<2	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
1,1,2,2-Tetrachloroethane	<1	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1,1,2-Trichloroethane	<2.5	<1	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	<1	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1,1-Dichloroethylene	<3	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
1,1-Dichloropropene	<2.5	<1	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,3-Trichlorobenzene	<0.75	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
1,2,3-Trichloropropane	<8	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2
1,2,4-Trichlorobenzene	<1	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1,2,4-Trimethylbenzene	44.2	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
1,2-Dibromo-3-Chloropropane	<6.5	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6
1,2-Dibromoethane	<1.5	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
1,2-Dichlorobenzene	<0.75	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
1,2-Dichloroethane	<1.5	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
1,2-Dichloropropane	<1	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1,3,5-Trimethylbenzene	25.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	<3	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
1,3-Dichloropropane	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1,4-Dichlorobenzene	<1	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
1-Chlorohexane	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,2-Dichloropropane	<0.75	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5
2-Butanone(MEK)	<1.3						
2-Chloroethyl Vinyl Ether	<8.8						
2-Chlorotoluene		<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
2-Hexanone(MBK)	<1						
4-Chlorotoluene		<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
4-Methyl-2-pentanone(MIBK)							
Acetone	<1.5						
Acrolein							
Acrylonitrile							
Benzene	<1	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Bromobenzene	<0.75	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Bromochloromethane	<1	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Bromodichloromethane	<2	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Bromoform	<3	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
Bromomethane	<2.8	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1
c-1,2-Dichloroethene	<3	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
c-1,3-Dichloropropene	<2.5	<1	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon Disulfide							
Carbon Tetrachloride		<2.1	<2.1	<2.1	<2.1	<2.1	<2.1
Chlorobenzene		<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Chloroethane	<5.3	<1	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform	<1	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chloromethane	<0.75	<1.3	<1.3	0.26 F	<1.3	<1.3	<1.3
Dibromochloromethane	<3.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibromomethane	<2.5	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4
Dichlorodifluoromethane	<1.3	<1	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Hexachlorobutadiene	<2.5	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1
Isopropyl Benzene	40.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
m&p-Xylene	13.5	<1	0.22 F	<1.0	<1.0	0.52 F	<1.0
Methylene Chloride	<2.8	<0.3	<0.3	<0.3	<0.3	0.19 F	<0.3
Methyl-tert-butyl Ether	9.56						
Naphthalene	<0.75	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
n-Butylbenzene		<1.1	<1.1	<1.1	<1.1	<1.1	<1.1
n-Propyl Benzene	33.2	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
o Xylene	<2.8	<1.1	0.50 F	<1.1	<1.1	<1.1	<1.1
p-Isopropyltoluene	48.3	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
sec-Butylbenzene	98.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
Styrene	4.49	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
t-1,2-Dichloroethylene	<3.3	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
t-1,3-Dichloropropene	1.85	<1	<1.0	<1.0	<1.0	<1.0	<1.0
t-Butylbenzene	<1.5	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4
Tetrachloroethylene	<2.5	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4
Toluene	<3.5	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1
Trichloroethylene	<3.5	<1	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	<2.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Vinyl Acetate	<2.5						
Vinyl Chloride	<2	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1
Xylene-Total	<2.8						

H90S
SS08

Volatile Organic Compounds

Lab:	JPB	JPB	CAS	CAS	CAS	CAS	CAS
Date:	7/21/99	7/31/00	6/15/01	10/15/01	1/3/02	4/2/02	7/8/02
Method:	8260	8260	8260	8260	8260	8260	8260
Unit:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
1,1,1,2-Tetrachloroethane	<25	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	<40	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
1,1,2,2-Tetrachloroethane	<20	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1,1,2-Trichloroethane	<50	<1	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	<20	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1,1-Dichloroethylene	<60	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
1,1-Dichloropropene	<50	<1	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,3-Trichlorobenzene	<15	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
1,2,3-Trichloropropane	<160	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2
1,2,4-Trichlorobenzene	<20	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1,2,4-Trimethylbenzene	434	<1.3	<1.3	<1.3	1.86	26.42	17.27
1,2-Dibromo-3-Chloropropane	<130	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6
1,2-Dibromoethane	<30	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
1,2-Dichlorobenzene	<15	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
1,2-Dichloroethane	<30	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
1,2-Dichloropropane	<20	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1,3,5-Trimethylbenzene	<25	<0.5	<0.5	<0.5	1.41	8.76	6.29
1,3-Dichlorobenzene	<60	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
1,3-Dichloropropane	<20	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1,4-Dichlorobenzene	<15	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
1-Chlorohexane	<25	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,2-Dichloropropane	<175	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5
2-Butanone(MEK)							
2-Chloroethyl Vinyl Ether							
2-Chlorotoluene	<20	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
2-Hexanone(MBK)							
4-Chlorotoluene	<30	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
4-Methyl-2-pentanone(MIBK)							
Acetone							
Acrolein							
Acrylonitrile							
Benzene	135	<0.4	<0.4	<0.4	0.23 F	0.20 F	0.31 F
Bromobenzene	<15	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Bromochloromethane	<20	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Bromodichloromethane	<40	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Bromoform	<60	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
Bromomethane	<55	<1.1	0.27 F	<1.1	<1.1	<1.1	<1.1
c-1,2-Dichloroethene	<60	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
c-1,3-Dichloropropene	<50	<1	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon Disulfide							
Carbon Tetrachloride	<110	<2.1	<2.1	<2.1	<2.1	<2.1	<2.1
Chlorobenzene	<20	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Chloroethane	<15	<1	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform	<65	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chloromethane	<50	<1.3	0.23 F	0.10 F	<1.3	<1.3	0.29 F
Dibromochloromethane	<25	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibromomethane	<120	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4
Dichlorodifluoromethane	<50	<1	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	651	<0.6	<0.6	<0.6	0.18 F	16.26	15.87
Hexachlorobutadiene	57.7	<0.4	<1.1	<1.1	<1.1	<1.1	<1.1
Isopropyl Benzene	<55	<1.1	<0.5	<0.5	<0.5	1.00	4.18
m,p-Xylene	49.3	<0.5	<1.0	<1.0	4.84	106.50	70.56
Methylene Chloride	<15	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Methyl-tert-butyl Ether							
Naphthalene	63.5	<0.4	<0.4	<0.4	1.15	1.49	3.36
n-Butylbenzene	<55	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1
n-Propyl Benzene	<55	<1.1	<0.4	<0.4	<0.4	0.38 F	2.79
o Xylene	1630	<0.6	<1.1	<1.1	<1.1	0.21 F	0.20 F
p-Isopropyltoluene	<60	<1.2	<1.2	<1.2	<1.2	0.31 F	<1.2
sec-Butylbenzene	<65	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
Styrene	<20	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
t-1,2-Dichloroethylene	<30	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
t-1,3-Dichloropropene	<50	<1	<1.0	<1.0	<1.0	<1.0	<1.0
t-Butylbenzene	<70	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4
Tetrachloroethylene	<70	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4
Toluene	<55	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1
Trichloroethylene	<50	<1	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	<40	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Vinyl Acetate							
Vinyl Chloride	<55	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1
Xylene-Total							

APPENDIX C

SAMPLING AND ANALYSIS PLAN FIELD PROCEDURES

be third order (cf. Urquhart, L.C., 1962 *Civil Engineering Handbook*, 4th Edition, p. 96 and 97). An XY-coordinate system shall be used to identify locations. The X-coordinate shall be the East-West axis; the Y-coordinate shall be the North-South axis. The reference location is the origin. All surveyed locations shall be reported using the *Michigan State Plane Coordinate System* (1983 datum, unless otherwise requested). The surveyed control information for all data collection points shall be recorded and displayed in a table. The table shall give the X and Y coordinates in state plane coordinate values, the ground elevation, and the measuring point elevation if the location is a groundwater *monitoring well*. The elevation of all newly installed wells and piezometers shall be surveyed at the water level measuring point (notch) on the riser pipe. *The ground surface elevations shall be included* in the survey.

5.12 EQUIPMENT DECONTAMINATION

All equipment that may directly or indirectly contact samples shall be decontaminated in a designated decontamination area. This includes casing, drill bits, auger flights, the portions of drill rigs that stand above boreholes, sampling devices, and instruments, such as slugs and sounders. In addition, the contractor shall take care to prevent the sample from coming into contact with potentially contaminating substances, such as tape, oil, engine exhaust, corroded surfaces, and dirt.

The following procedure shall be used to decontaminate large pieces of equipment, such as casings, auger flights, pipe and rods, and those portions of the drill rig that may stand directly over a boring or well location or that come into contact with casing, auger flights, pipe, or rods. The external surfaces of equipment shall be washed with high-pressure hot water and Alconox, or equivalent laboratory-grade detergent, and if necessary scrubbed until all visible dirt, grime, grease, oil, loose paint, rust flakes, etc. have been removed. The equipment shall then be rinsed with potable water. The inside surfaces of casing, drill rod, and auger flights shall also be washed as described. *In general, heavy equipment decontamination will be performed in Building 5092 at Wurtsmith AFB.*

The following procedure shall be used to decontaminate sampling and drilling devices, such as split spoons, bailers, and augers that can be hand-manipulated. For sampling and smaller drilling devices, scrub the equipment with a solution of potable water and Alconox, or equivalent laboratory-grade detergent. Then rinse the equipment with copious quantities of potable water followed by an ASTM Type II Reagent-Grade Water. High pressure liquid chromatograph (*HPLC*) grade water and distilled water purchased in stores are not acceptable substitutes for ASTM Type II Reagent-Grade Water. (If equipment has come in contact with oil or grease, rinse the equipment with pesticide-grade methanol followed by pesticide-grade hexane.) Air dry the equipment on a clean surface or rack, such as Teflon[®], stainless steel, or oil-free aluminum elevated at least two feet above ground. If the sampling device shall not be used immediately after being decontaminated, it shall be wrapped in oil-free aluminum foil, or placed in a closed stainless steel, glass, or Teflon[®] container.

ASTM Type II Reagent-Grade Water, methanol, and hexane shall be purchased, stored, and dispensed only in glass, stainless steel, or Teflon® containers. These containers shall have Teflon® caps or cap liners. It is the contractor's responsibility to assure these materials remain free of contaminants. If any question of purity exists, new materials shall be used.

5.13 WASTE HANDLING

The procedures for non-investigative waste will be followed, as required. The general wastes generated by the Base will be handled according to the following procedures.

5.13.1 General Waste Handling Procedures

Waste handling shall be dealt with on a site-by-site basis. Waste may be classified as *non-investigative* waste or investigative waste.

Non-investigative waste, such as litter and household garbage, shall be collected on an as-needed basis to maintain each site in a clean and orderly manner. This waste shall be containerized and transported to the designated sanitary landfill or collection bin. Acceptable containers shall be sealed boxes or plastic garbage bags.

Investigation derived waste shall be properly containerized and temporarily stored at each site prior to transportation. Depending on the constituents of concern, fencing or other special marking may be required. The number of containers shall be estimated on an as-needed basis. Acceptable containers shall be sealed U.S. Department of Transportation (DOT)-approved steel 55-gallon drums or small dumping bins with lids. The containers shall be transported in such a manner as to prevent spillage or particulate loss to the atmosphere. To facilitate handling, the containers shall be no more than half full when moved.

The investigative derived waste shall be segregated at the site according to matrix (solid or liquid) and as to how it was derived (drill cuttings, drilling fluid, decontamination fluids, and purged groundwater). Each container shall be properly labeled with site identification, sampling point, depth, matrix, constituents of concern, and other pertinent information for handling.

5.14 HYDROGEOLOGICAL CONCEPTUAL MODEL

The project geologist or engineer shall develop a base and site geological and hydrological conceptual model from pre-existing USGS, regional, state, and local studies and information developed during the project. Maps and cross sections shall be used to depict the conceptual model. The model shall be the basis for evaluating *monitoring well* and piezometer locations, contaminant distribution (plume delineation), and the closeness of the fit to natural conditions of analytical or computer-based numerical models.

Purge pump intakes shall be equipped with a positive foot check valve to prevent purged water from flowing back into the well. Purging and sampling shall be performed in a manner that minimizes aeration in the well borehole and agitation of the sediments in the well and formation. Equipment shall not be allowed to free-fall into a well.

In addition to the information required in [Section 8.0](#), the following information shall be recorded each time a well is purged and sampled: (1) depth to water before and after purging, (2) well bore volume calculation, (3) sounded total depth of the *monitoring well*, (4) the condition of each well, including visual (mirror) survey, (5) the thickness of any nonaqueous layer, and (6) field parameters, such as pH, temperature, specific conductance, and turbidity. This information shall be encoded in *Environmental Restoration Program Information Management System (ERPIMS)* files when required.

6.1.1.1 Water Level Measurement

An interface probe shall be used if a nonconductive floating product layer is suspected in the well. The interface probe shall be used to determine the presence of floating product, if any, prior to measurement of the groundwater level. The groundwater level shall then be measured to the nearest 0.01 foot using an electric water level indicator. Water levels shall be measured from the notch located at the top of the well casing and recorded on the *field data log*. If well casings are not notched, measurements shall be taken from the north edge of the top of the well casing, and a notch shall be made using a decontaminated metal file.

Following water level measurement, the total depth of the well from the top of the casing shall be determined using a weighted tape or electric sounder and recorded on the *field data log*, *except in the case of low-flow sampling, as described in the following paragraph*. The water level depth shall then be subtracted from the total depth of the well to determine the height of the water column present in the well casing. All water level and total depth measuring devices shall be routinely checked with a tape measure to ensure measurements are accurate.

During low-flow sampling care shall be taken not to disturb any sediment at the bottom of the well casing prior to purging and sampling. Therefore, the total depth of the well shall be taken from the previous sampling log for determination of the water column height. Following purging and sample collection, the total depth of the well shall be measured and recorded.

6.1.1.2 Purgung Prior to Sampling

Purging of *monitoring wells* is performed to evacuate water that has been stagnant in the well *that may not be representative of the groundwater quality conditions present in the aquifer*. Purging shall be accomplished using a Teflon® bailer or a pump. At least three well volumes shall be removed from the well before it is sampled. The well bore volume is defined as the volume of the submerged casing and screen. One well volume can be calculated using the following equation (reference: Ohio U.S. EPA Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring Programs, June 1993):