Deerinwater Environmental Management Services, Inc.

FINAL REPORT
Book 1 of 2

For

The Expanded Site Investigation Phase II
Former Atlas Missile Site No. 7
Vernon, Texas

Prepared For
U.S. Army Corps of Engineers
Tulsa District
Contract No. DACA56-01-D-2005,
Task Order No. 001

February 2002

Prepared By

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All of the previous material is contained in Volume One of Two.

Acronym List

AMS	Atlas Missile Site
ASTM	American Society of Testing Materials
bgs	below ground surface
CFR	Code of Federal Regulations
COC	Contaminate of Concern
COPC	Contaminate of Potential Concern
DEMS	Deerinwater Environmental Management Services
DO	Dissolved Oxygen
DOD	Department of Defense
EB	Equipment Blank
EPA	U.S. Environmental Protection Agency
ESI	Expanded Site Investigation
FFA	Future Farmers of America
GW	Ground Water
GWP	Ground Water Protection
HTRW	Hazardous, Toxic, Radioactive Waste
IDW	Investigative Derived Waste
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicate
MSCs	Medium Specific Concentrations
MK	Morrison Knudsen Corporation
msl	Mean Sea Level
MW	Monitoring Well
NAVD	North American Vertical Datum
NGVD	National Geodetic Vertical Datum
PA/SI	Preliminary Assessment and Site Inspection
PCB	Polychlorinated Biphenyl
PID	Photoionization Detector
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RRS-II	Risk Reduction Standards No. 2

SI	Site Inspection
SOP	Standard Operating Procedure
SOW	Scope of Work
SVOC	Semi-volatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure
TCE	Trichloroethene or Trichloroethylene
TDH	Texas Department of Health
TEPH	Total Extractable Petroleum Hydrocarbons
TPH	Total Petroleum Hydrocarbons
TNRCC	Texas Natural Resource Conservation Commission
TRPH	Total Recoverable Petroleum Hydrocarbons
USACE	U.S. Army Corps of Engineers
UST	Underground Storage Tank
VOC	Volatile Organic Compound

1.0 INTRODUCTION

1.1 Expanded Site Investigation Phase II Objectives

This report presents the results of the Expanded Site Investigation, Phase II (ESI Phase II) preformed September of 2001, at the former Atlas Missile Site No. 7 located near Vernon, Texas. The objectives of this ESI Phase II was to confirm the nature and extent of contaminants encountered during previously performed site investigations.

The ESI Phase II activities included the collection and chemical analysis of 65 surface soil samples. Collected soil samples were analyzed for the eight (8) RCRA metals, zinc, and PCBs to further define the lateral extent of existing soil contamination and to establish actual soil background concentrations. Four existing groundwater monitoring wells were redeveloped and groundwater samples collected. The collected groundwater samples were analyzed for the 8 RCRA metals, zinc, VOAs, SVOAs, Pesticides/PCBs, Herbicides, and TPH. This final ESI Phase II report discusses the physical description of the site, site history, discussion of the past and current field investigation activities, past and current investigation results, identification of potential data gaps, and recommendations for further investigation to achieve site closure under the Texas Natural Resource Conservation Commission (TNRCC) Risk Reduction Rules Standard No. 2 (RRS-II) Residential.

This final ESI Phase II report was prepared by Deerinwater Environmental Management Services, Inc. (DEMS) for the U.S. Army Corps of Engineers (USACE), Tulsa District, under Contract No. DACA56-01-D-2005, Task Order No.0001.

1.2 ESI Phase II Report Organization

Section 1 is the project introduction, this will highlight the ESI Phase II investigation goals. The historical use of the site is outlined in Section 2. Details of previous investigations are summarized in Section 3. Section 4 identifies the field investigation tasks, and Section 5 presents the analytical results of the ESI Phase II.

Section 6 is the Executive Summary, and Section 7 includes recommendations. Section 8 includes all reference material utilized in the preparation of this final report.

2.0 Site Background

2.1 Project Site Location

The former AMS No. 7 is located approximately 13 miles north-northwest of Vernon, Texas in Wilbarger County (**Figure 1**).

2.2 Regional Setting

The former Atlas Missile Site No. 7 is located in the gently rolling topography of northwestern Wilbarger County, Texas known as the Odell Sand Hills. This site has as an average elevation of 1365 feet above mean sea level (msl). Due to the sandy soils of the area, the surface drainage system in the Odell Sand Hills is poorly developed.

2.3 Site Background Information

2.3.1 Site History

Department of Defense (DOD) use began in 1960 with the acquisition of land at various locations in Oklahoma and Texas to be used for Atlas Missile Sites. Improvements at each site included underground missile silos, quonset huts, underground launch control centers, septic systems, water supply, fences, and roads. The AMS sites were declared to be excessive, by the DOD in approximately 1967. The United States Government, acting through the Department of Health, Education and Welfare, conveyed the property formerly AMS No. 7 by deed without warranty to the Northside Independent School District.

2.3.2 Site Ownership

The current property owner is the Northside Independent School District. The School district uses the facility for Future Farmers of America (FFA) exhibitions and livestock shows.

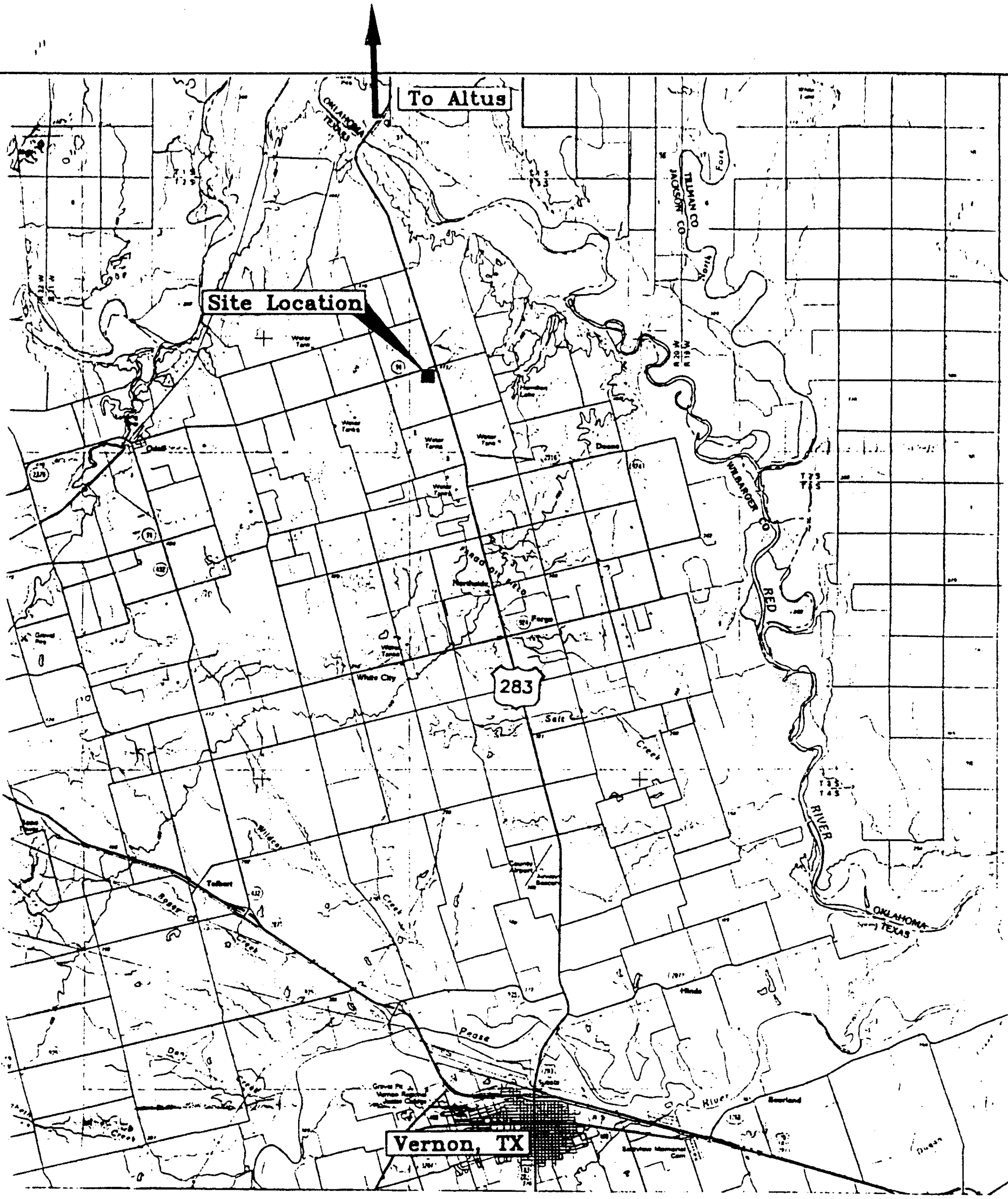

Figure 1

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT

D•E•M•S

ATLAS MISSILE SITE No. 7
Vernon, TX
Site Vicinity Map

DESIGNED BY	E. PENN	12/13/01	CHECKED BY	J. PIONESSA	12/13/01
DRAWN BY	G. FLICK	12/13/01	APPROVED BY	J. PIONESSA	12/13/01

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2.4 Regional and Site Physiography, Geology and Underlying Aquifers

The near surface stratigraphic units consist of Quaternary age surficial deposits and underlying Permian age redbeds. The surficial deposits at the site consist of a thin mantle of recent age wind-blown sands and silt, that overly the Pleistocene age Seymour formation (Willis and Knowles, 1953). The Seymour formation is fluvial in origin and is comprised of fine to medium grained sands with interbedded silts and clays. Previous investigations at AMS No. 7 reported a thickness of Quaternary age surficial deposits ranging from 42 to 80 feet thick. The Seymour formation rests directly on the Permian age San Angelos formation of the Peace River Group. The Seymour Aquifer is the major groundwater aquifer for Wilbarger County. The aquifer is used locally for water supply and irrigation. The Seymour Aquifer is unconfined. The underlying San Angelos Formations is a minor aquifer in Wilbarger County. It has not been determined in past and current investigations that the San Angelos aquifer is under confined conditions or in connection with the overlying Seymour aquifer.

Four (4) monitoring wells were installed during the Expanded Site Investigation conducted by Morrison Knudsen Corporation (MK) in 2000. **Table 2.4** summarizes the total depth, producing aquifer, and elevation for each monitoring well as recorded during ESI field activities performed in 2000 by MK. Detailed well construction diagrams and well bore hole logs can be found in **Appendix K**.

Table 2.4

Monitoring Well Total Depths and Producing Aquifer

Former Atlas Missile Site No. 7, Vernon, Texas

Monitoring Wells	TOC Elevation msl (feet)	Hydro-Stratigraphic Unit	Total Depth bgs (feet)
MW-06	1365.07	Seymour	31.5
MW-07	1370.88	Seymour	23.53
MW-08	1365.94	Seymour	25
MW-09	1366.22	San Angelos	220

Morrison Knudsen, ESI Final Report, January 2001

It was concluded in the Morrison Knudsen Final ESI Report that two hydrostatic units are intersected by the monitoring wells installed at this site. One unit is the Shallow Pleistocene age Seymour Formation and the other is the Permian age San Angelos Formation. Hydrostatic water measurements were taken from the three-groundwater monitoring wells located within the Seymour formation, this indicated the aquifers gradient is to the northwest.

The deep bedrock aquifer is intersected by only one groundwater-monitoring well (MW-09). This one groundwater-monitoring well is not adequate to determine actual groundwater gradient for the San Angelos aquifer.

This interpretation is supported by the information gathered during the performance of this ESI Phase II. Prior to redeveloping each groundwater monitoring well, the static water level in each well was measured with an electric water level indicator to 1/100 foot. Measurements were taken from pre-established top of casing identification marks at the top of each well casing. **Table 2.5** illustrates the static water level measurements prior to redevelopment. The static water level measurements were recorded on the groundwater sampling form for each well (**Appendix C**).

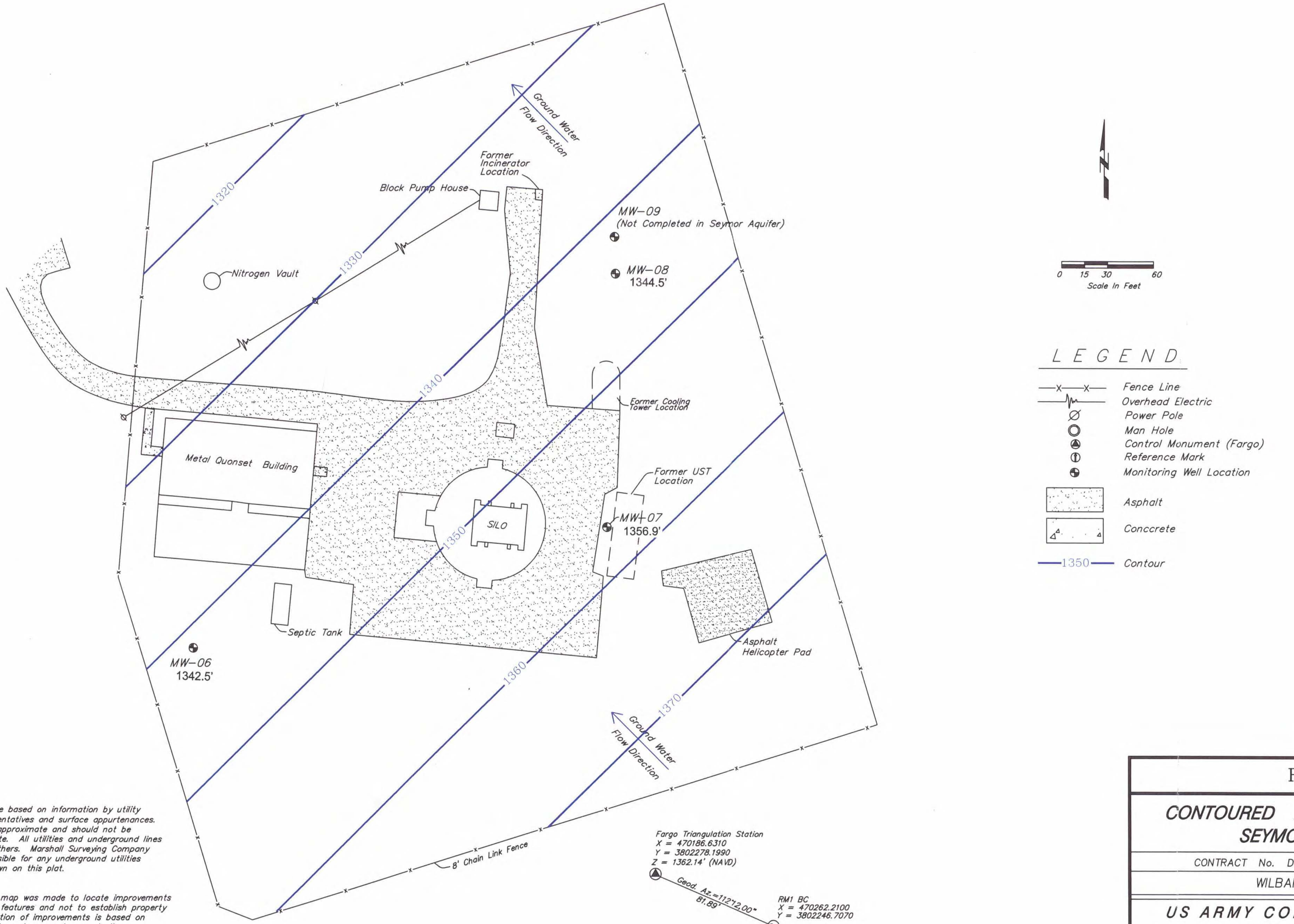
Table 2.5

Static Water Level Measurements

Monitoring Wells	TOC Elevation msl (feet)	Static Water Elevation msl (feet)	Hydro-Stratigraphic Unit	Static Water Depth bgs (feet)
MW06	1365.07	1342.53	Seymour	22.54
MW07	1370.88	1356.90	Seymour	13.98
MW08	1365.94	1344.49	Seymour	21.45
MW09	1366.22	1344.15	San Angelos	22.07

ESI Phase II, DEMS, September 2001

A contoured potentiometric surface (water table) of the Seymour aquifer, based upon static water level measurements taken prior to redevelopment, is included as **Figure 2**. Results confirm groundwater gradient direction for the Seymour formation is to the northwest.



NOTES

Utility locations are based on information by utility companies, representatives and surface appurtenances. Location may be approximate and should not be considered complete. All utilities and underground lines were located by others. Marshall Surveying Company will not be responsible for any underground utilities shown or not shown on this plat.

This topographical map was made to locate improvements and topographical features and not to establish property corners. The location of improvements is based on existing monuments and apparent property lines.

Surveying & Mapping By
MARSHALL SURVEYING COMPANY
P.O. Box 1221 Seminole, Oklahoma 74868 (405) 382-4488
CA 2261 LS Expires June 30, 2003

FIGURE 2

CONTOURED POTENTIOMETRIC SURFACE SEYMOR AQUIFER (AMS No. 7)

CONTRACT No. DACA 56-01-D-2005 TASK ORDER No.1

WILBARGER COUNTY, TEXAS

US ARMY CORPS OF ENGINEERS
TULSA DISTRICT
1645 SOUTH 101st EAST AVENUE, TULSA, OKLAHOMA

DEERINWATER ENVIRONMENTAL MANAGEMENT SERVICES, INC.

Drawn By: JLA & SRR	Checked By: JBM	Date: DECEMBER 4, 2001
SHEET 1 OF 1	Job No. 47401	Revised:

3.0 Previous Environmental Investigations

3.1 Previous Environmental Investigations

Previous investigative efforts consisted of a Preliminary Assessment and Site Inspection (PA/SI) conducted in 1995, demolition and closure of various DOD structures in 1999, and an ESI performed in 2000.

The PA/SI was conducted in 1995 by the USACE, Tulsa District as part of the DOD Environmental Restoration Program. The primary objective of the PA/SI was to determine if there was a release or potential of hazardous substances due to past DOD usage of the site.

The PA included gathering and reviewing existing site information, interviews of former site personnel, DOD files, published geological/hydro-geological reports, and aerial photography. The completed PA identified the following sources for potential releases as:

- On-site storage tanks used to provide fuel for electrical generators and incinerator.
- Fuels and oils used for equipment maintenance, and
- The hydraulic system used to operate the silo launch bay doors.

The SI that followed the PA was to determine if site soils or groundwater contamination had occurred as a result of past DOD activities. SI activities consisted of performing the following:

- Collection of surface soil samples
- Installation of three shallow boreholes for surface and subsurface soils data collection.
- Installation of a shallow groundwater monitoring well and one deep groundwater-monitoring well to assess groundwater quality.
- Collection of water samples from the missile silo, groundwater monitoring wells, and on-site domestic water well.

3.1.1 PA/SI Findings and Recommendation - USACE (1995)

All references to field operations, analytical results and conclusions given in this report were taken from the Morrison Knudsen January 2001 Expanded Site Investigation Report. Original data was not provided to DEMS. Morrison Knudsen reported that no Volatile Organic Compounds (VOCs) were detected in the soil or groundwater and all metals detected were stated as within the acceptable background ranges. However, total recoverable petroleum hydrocarbon (TRPH) and several Semi-volatile Organic Compounds (SOVCs) were detected in soils and groundwater samples. Bis (2-ethylhexyl) phthalate was the only SVOC detected in soils. This contaminate was detected in all three boreholes and at various depths ranging from the surface to 25 feet below ground surface (bgs). SVOCs detected in groundwater samples included Bis(2-ethlhexyl) phthalate, benzoic acid, di-n-octylphthalate, and phenol.

It was concluded in the 1995 USACE SI report, as represented in the Morrison Knudsen January 2000 report, that Bis(2-ethlhexyl) phthalate is commonly added to plastics to enhance flexibility. Therefore the presence of this compound in soil samples and groundwater was probably due to leaching of this compound from sampling equipment and rubber gloves used in sampling, rather than a result of former DOD activities. The USACE SI 1995 report also stated that the other SVOCs detected in groundwater were known laboratory contaminants and were thought to be introduced during the laboratory analysis procedures. The Morrison Knudsen January 2001 report did not provide any conclusions as to the potential source of the detected TRPH. The findings of the SI report recommended no further action was required at this site. The two monitoring wells installed during the 1995 PA/SI were plugged and abandoned in May of 1998 by the USACE.

In March 1999, the TNRCC completed its review of the 1995 SI report and responded with a Notice of Deficiency to the USACE, Tulsa District, disagreeing that the presence of SVOC contaminants were not field sampling or laboratory contamination, and that potential impacts to the upper and lower aquifers had not been properly evaluated. The TNRCC review and comments prompted the USACE, Tulsa District to review the data collected during the 1995 SI. The USACE concluded that the data collected was questionable due to various quality control issues. This prompted the USACE, Tulsa District to contract an ESI, which was performed by Morrison Knudsen in 2000.

3.1.2 Expanded Site Investigation, Morrison Knudsen (MK 2001)

Morrison Knudsen conducted all field ESI activities in 2000. MK presented their findings for the AMS No. 7 ESI to the USACE in a final report dated January 2001.

The following is a brief description of field activities performed during the 2000 ESI.

- Collection of surface soil samples for chemical analysis.
- Drilling and continuous coring of three shallow boreholes. Boreholes were drilled to the top of the alluvial/bedrock contact. Soil samples were collected for chemical analysis at 5-foot intervals within the vadose zone at each borehole and at the underlying alluvial/bedrock, contact and soils were lithologically described.
- Drilling and continuous coring of one deep borehole. The deep borehole was drilled to 210 feet bgs.
- Subsequent installation of monitoring wells at each borehole location. Well development and groundwater sampling at each well following well installation.

3.1.3 MK (2001) ESI Surface Soil Sample Results

In the MK ESI 2001 final report, all analytical results, except detected metal concentrations in soils, were compared to the TNRCC RRS-II medium specific concentrations (MSCs) applicable to industrial activities **(Appendix G)**. All analytical results for detected metals in soils were compared to the Texas Specific Background Concentrations (TNRCC Interoffice Memorandum dated June 28, 2000) **(Appendix H)**.

No pesticides, herbicides or TRPH were detected in the surface soil samples collected.

Bis(2-ethlhexyl) phthalate were not detected in surface or subsurface soils during the ESI performed by MK. The absence of detectable levels of this compound suggest that the presence of this SVOC detected in the 1995 PA/SI samples were a result of laboratory cross contamination and not from previous DOD usage.

All laboratory results for metals in the soil were found to be less than TNRCC Texas Specific Background Concentrations, with the exception of lead and zinc located in the areas associated with the old incinerator, cooling tower, and underground storage tank (UST) locations.

Polychlorinated biphenyls (PCBs) were also detected in soil samples collected from areas near the incinerator, cooling tower, and UST locations. The detection of PCB contaminate is indicative of a prior release. However, PCB concentrations did not exceed the MSCs for inhalation, ingestion, and dermal contact, but do exceed the MSCs for groundwater protection. It was concluded in the MK ESI 2001 final report that because subsurface soil sample concentrations were non-detect for PCBs that the TNRCC groundwater protection criteria was met. **Table 3.3.1** lists the lead and zinc concentrations near the incinerator, cooling tower and former UST location.

Table 3.1.3

MK (2001) Surface Soil Results Metals

Sample Locations **Incinerator**	**Lead**	**Zinc**
SS08	152 mg/kg	102 mg/kg
SS09	19.3 mg/kg	45.6 mg/kg
SS10	10.4 mg/kg	18.8 mg/kg
Cooling Tower	.	
SS11	18.4 mg/kg	181 mg/kg
SS12	6.6 mg/kg	32.2 mg/kg
USTs		
SS13	22.2 mg/kg	44.3 mg/kg
SS14	14.5 mg/kg	11 mg/kg

Results taken from MK ESI report January 2001

3.1.4 MK (2001) ESI Subsurface Soil Sample Results

Subsurface soil samples were collected from three separate borehole locations (BH06, BH07 and BH08). All laboratory results for metals were less than the TNRCC Texas specific background concentrations. Several VOC and SVOC compounds were detected in the subsurface soil samples, with all results below the MSC values for inhalation, ingestion, dermal contact, and groundwater protection. **Table 3.1.4** lists the subsurface soil sample results.

Table 3.1.4

MK (2001) Volatiles/Semivolatile Organics Results

Suite/Compound	Borehole BH06				Borehole BH07		Borehole BH08				
	S-05	S-10	S-18	S-76	S-05	S-10	S-05	S-10	S-15	S-18	S-80
VOC (ug/kg)											
Acetone	41.2	--	16.1	34.6	--	--	52.2	26.4	62.5	27.8	26.7
Methylene Chloride	44.0	51.0	32.7	--	21.1	25.2	26.7	30.5	35.8	34.6	20.5
Toluene	--	--	--	--	3.96	--	--	--	--	--	--
Trichloroethene (TCE)	--	--	--	--	--	--	--	--	--	36.7	--
1,2,4-Trimethylbenzene	--	--	--	--	2.08	--	--	--	--	--	--
Xylenes	--	--	--	--	4.48	--	--	--	--	--	--
VOC (ug/kg)											
Pentane	ND	ND	ND	ND	12.5J	ND	ND	ND	ND	ND	ND
SVOC (ug.kg)											
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	15J	ND	ND	ND	ND	ND

Results taken from MK ESI report January 2001
S-05 – sample ID denoting depth (in ft. bgs)
-- Compound not detected above MDL
ND – Non-Detect
J – estimated value

3.1.5 MK (2001) ESI Groundwater Sampling Results

Several VOC and SVOC compounds were detected in the groundwater samples but were below the MSC groundwater values with the only exception being Trichloroethene (TCE) with a concentration of 0.140 mg/l from monitoring well MW08, which exceeded the MSCs for the TNRCC administrative code for public drinking water of .005 mg/l. **Table 3.1.5** lists all detected analytes for the monitoring well groundwater samples.

Table 3.1.5
MK (2001) Organic Compounds, Metal and Inorganics Detected in Groundwater

Suite/Compound	Seymour Aquifer			San Angelos Aquifer
	MW06	MW07	MW08	MW09
VOCs (ug/l)				
1.1-Dichloroethylene	--	--	0.3	--
cis-1,2-Dichloroethylene	--	--	30	--
trans-1, 2-Dichloroethylene	--	--	2.8	--
Trichloroethylene (TCE)	--	--	**140**	--
VOC tics (ug/l)				
Acetone	--	--	8.7	--
Chloroform	--	--	0.5	--
4-Isopropyltoluene	--	--	0.1	--
SVOC tics (ug/l)				
Di(2-ethylhexyl)phthalate	--	--	1.0J	1.3J
Metals (ug/l)				
Antimony	--	--	1.0	--
Barium	200	410	320	260
Chromium	12	15	8.3	1.3
Copper	7.9	10	4.1	4.3
Lead	14	6.8	--	--
Nickel	12	18	8.7	100
Inorganics (mg/l)				
Fluoride	0.09	0.6	0.6	--
Nitrate	9.5	--	0.5	0.7
Nitrite	0.01	--	--	--

Results taken from MK ESI report January 2001
-- Compound not detected above MDL
J – estimated value

All reports referenced are on record and available for review at USACE, Tulsa District Office.

4.0 Field Investigation Activities

4.1 ESI Phase II Field Activities Overview

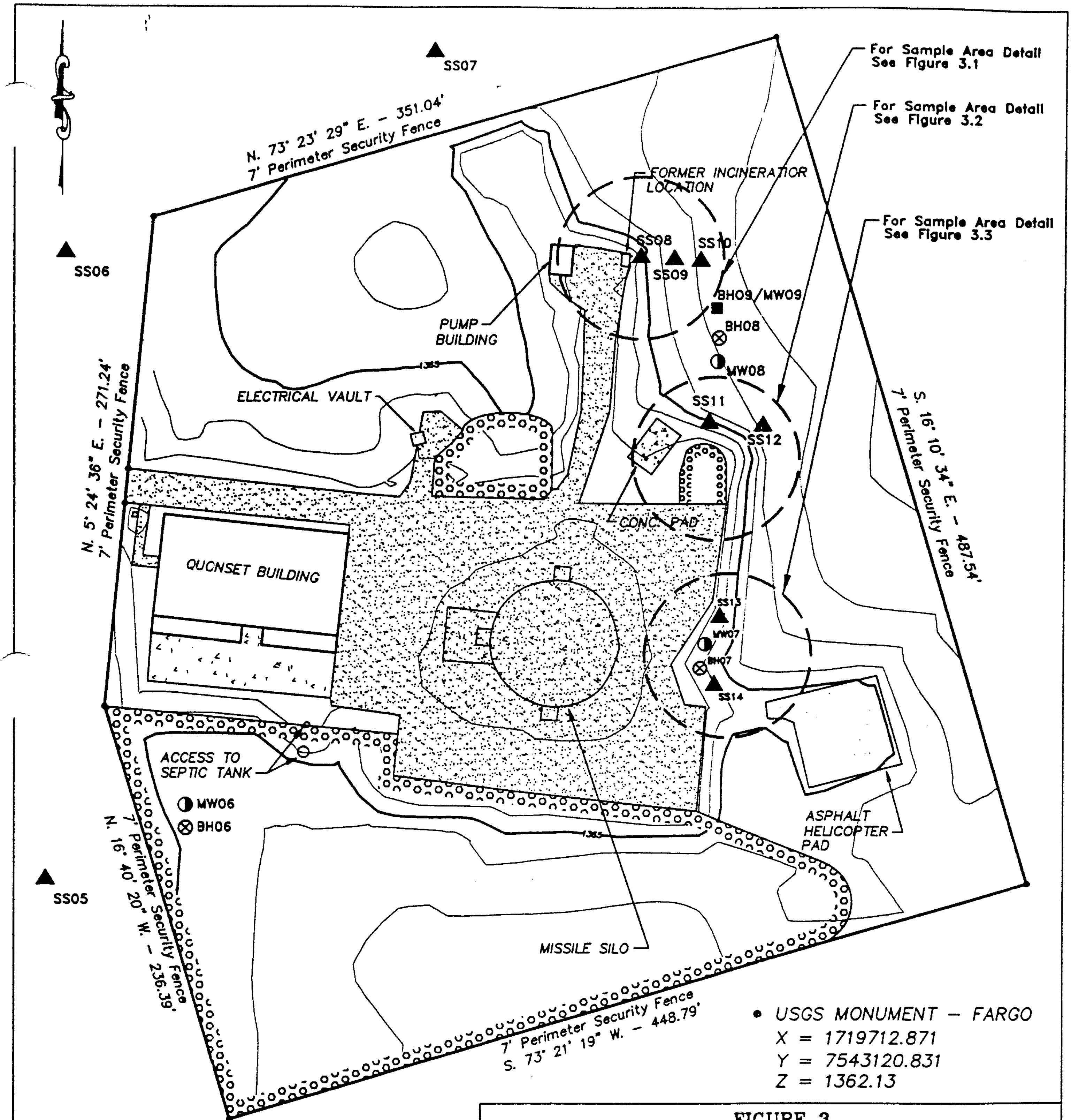
AMS No. 7 - Expanded Site Investigation, Phase Two Activities

- Collection of 65 surface samples analyzed for the eight (8) RCRA metals, zinc, and PCBs to further define the lateral extent of existing soil contamination and to establish actual background metal concentrations.
- Redevelopment of four existing groundwater monitoring wells, stabilization, well purging, collection of GW samples, analyzing of eight (8) RCRA metals, zinc, VOCs, SVOCs, Pesticides/PCBs, Herbicides, and TPH.
- Profiling, transportation and disposal of the Investigative Derived Waste (IDW).

Photographic documentation of field activities are located in **Appendix A.** A large-scale map detailing monitoring well locations, previous soil sample locations, current sampling locations, and major site features are included as **Appendix J**.

4.1.1 Surface Soil Samples

Various types of contamination were identified in the MK (2001) ESI final report. Soil samples taken from the areas of the incinerator, cooling tower, and UST indicated concentrations of lead and zinc potentially above acceptable background levels. Low levels of PCBs were also detected from soil samples collected near the incinerator, cooling tower, and UST. The PCBs results are indicative of a past release. This ESI Phase II identified these previous areas of concern that required further investigation. **Figures 3** shows the previous ESI sample locations (MK 2001) and the areas where additional surface soil sampling occurred during this ESI Phase II. **Figure 3.1** is a detailed map covering the area surrounding the former site of the incinerator. It includes the previous sampling locations (MK 2001) and new sample locations for this ESI Phase II, delineated by ten (10) foot square grids. **Figure 3.2** is a detailed map covering the area around the former site of the cooling tower. It also includes previous sampling locations and new sample locations for this ESI Phase II, delineated by ten (10) foot square grids. **Figure 3.3** is a detailed map covering the area surrounding the former UST site, which was removed during previous site activities. It includes the previous sampling locations and new sample locations used for this ESI Phase II, delineated by ten (10) foot square grids.



LEGEND

- ▲ ESI (MK, 2000) SURFACE SOIL SAMPLE LOCATIONS
- ■ BORE HOLE/MONITORING WELL LOCATIONS (MK, 2000)
- ◐ MONITORING WELL LOCATIONS (MK, 2000)
- ⊗ BORE HOLE LOCATIONS (MK, 2000)
- PERIMETER OF CLEAN FILL
- CONCRETE
- ASPHALT

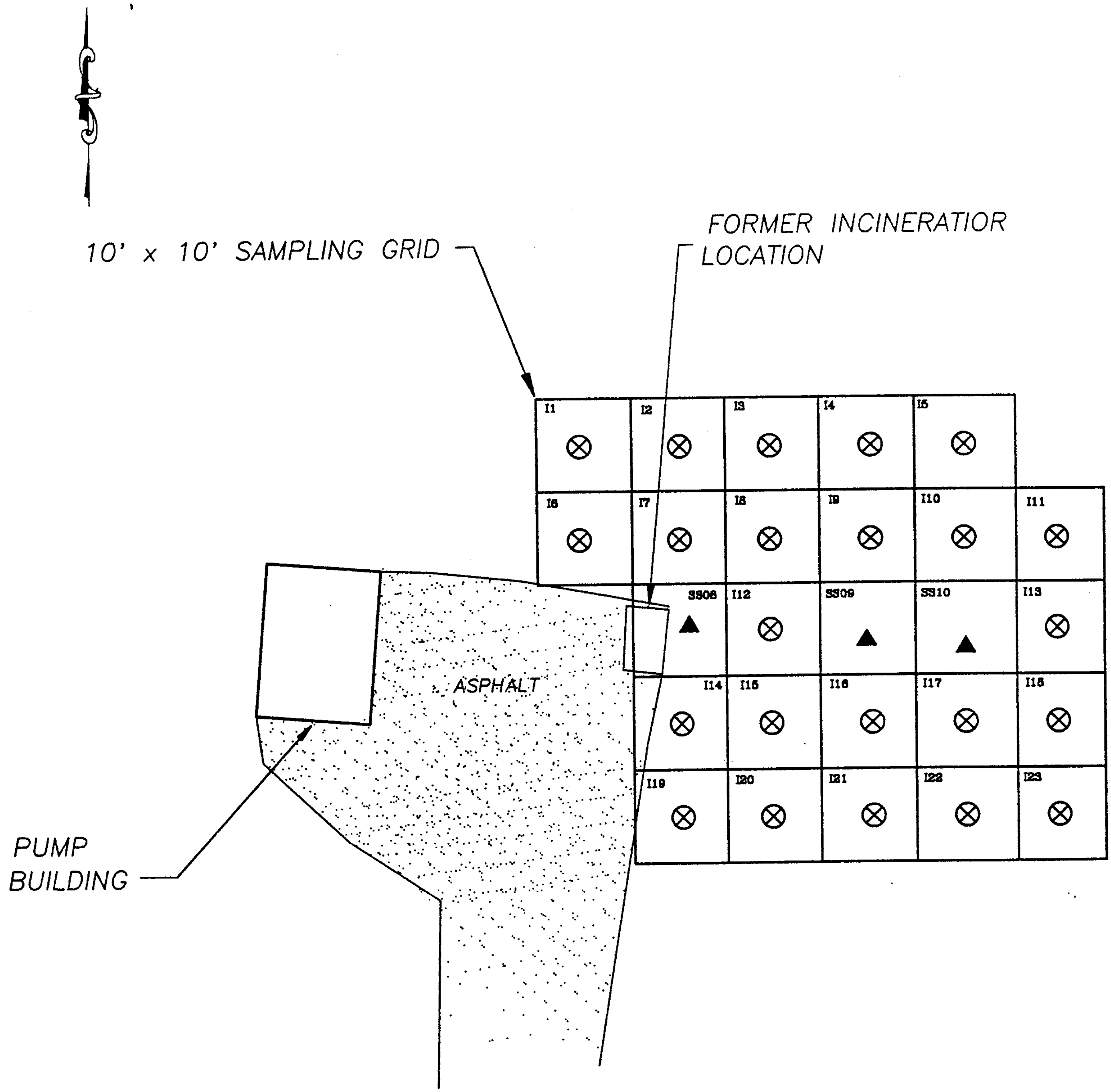
FIGURE 3

D•E•M•S

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT

ATLAS MISSILE SITE No. 7
SAMPLE LOCATIONS
Vernon, TX

DESIGNED BY	E. PENN	01/28/02	CHECKED BY	J. PIONESSA	01/28/02
DRAWN BY	G. FLICK	01/28/02	APPROVED BY	J. PIONESSA	01/28/02
SCALE: NO SCALE	DRAWING NO. 001		SHEET NO. 1 of 4	REVISION NO. 02	



Note: Table 5.1 – Cross Reference Grid #'s With Sample ID #'s.

LEGEND

- ▲ ESI (MK, 2000) SURFACE SOIL SAMPLE LOCATIONS
- ■ BORE HOLE/MONITORING WELL LOCATION
- ◐ MONITORING WELL LOCATION
- ⊗ ESI (DEMS, 2001) Surface Soil Sample
- PERIMETER OF CLEAN FILL
- CONCRETE
- ASPHALT

FIGURE 3.1

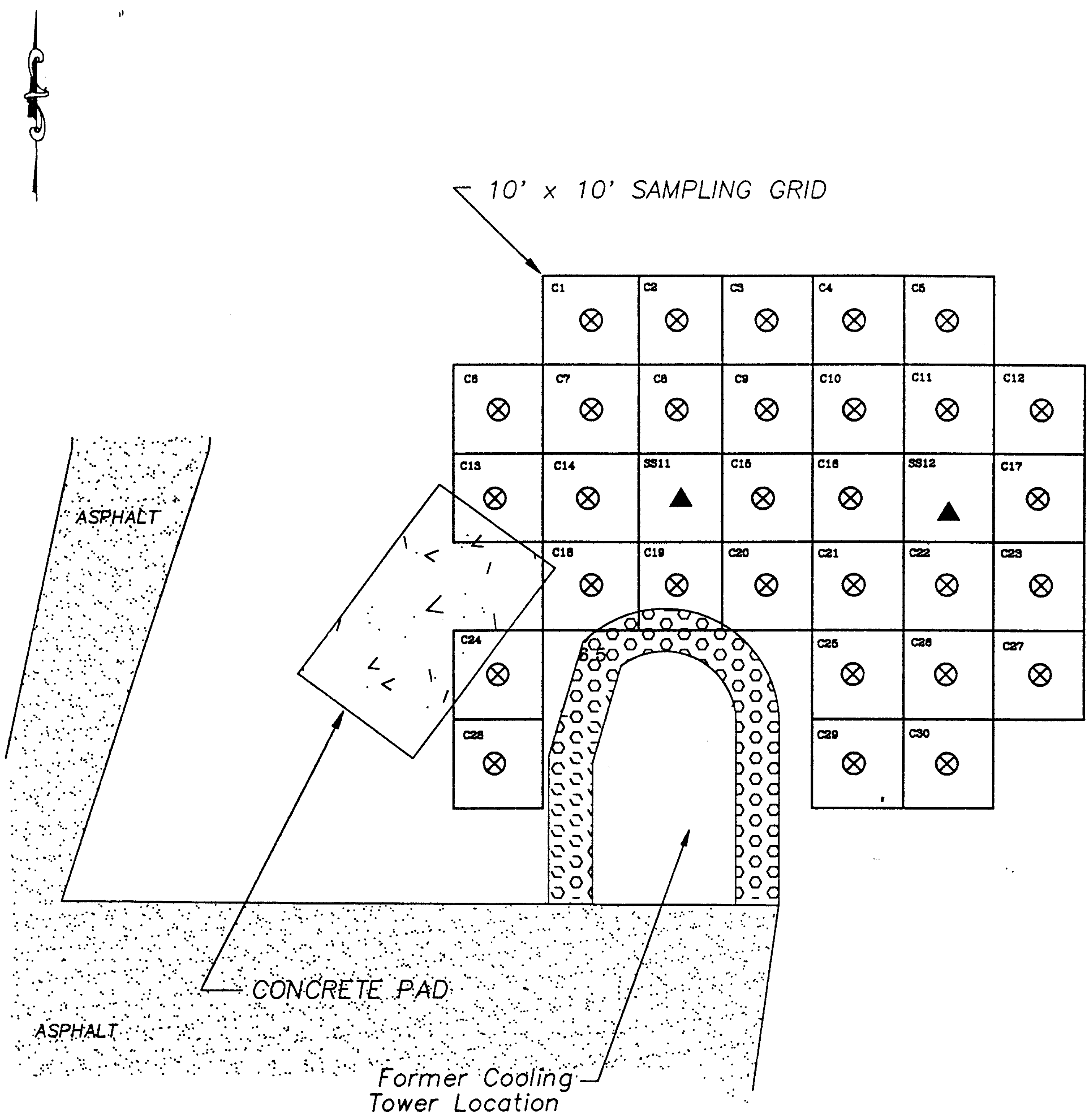
D■E■M■S

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT

ATLAS MISSILE SITE No. 7
Composite Sample Locations
Former Incinerator Location

DESIGNED BY	E. PENN	12/13/01	CHECKED BY	J. PIONESSA	12/13/01
DRAWN BY	G. FLICK	12/13/01	APPROVED BY	J. PIONESSA	12/13/01

SCALE: NO SCALE	DRAWING NO. 001	SHEET NO. 1 of 3	REVISION NO. 00

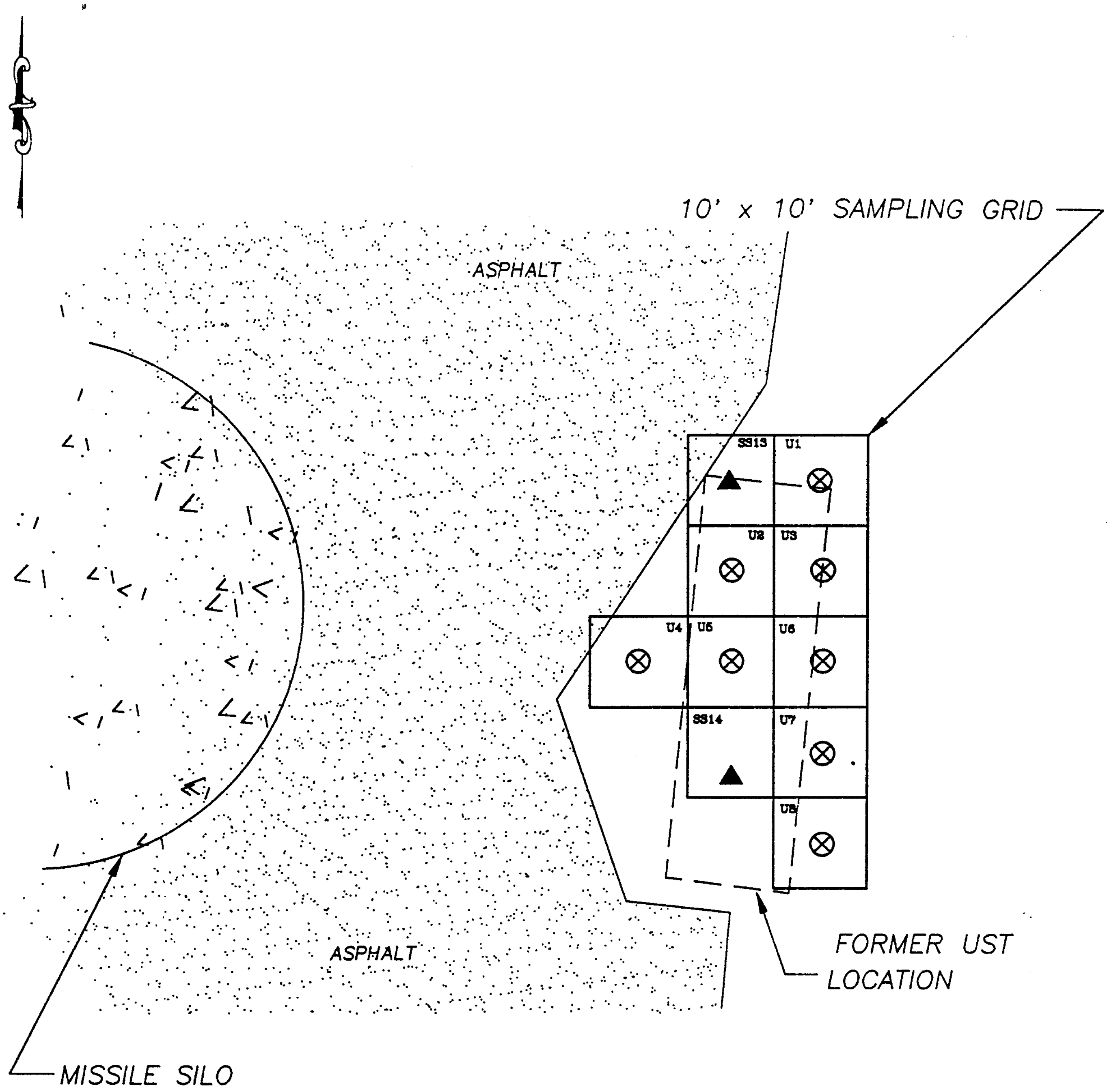


Note: Table 5.1 – Cross Reference Grid #'s With Sample ID #'s.

LEGEND

- ▲ ESI (MK, 2000) SURFACE SOIL SAMPLE LOCATIONS
- ■ BORE HOLE/MONITORING WELL LOCATION
- ◐ MONITORING WELL LOCATION
- ⊗ ESI (DEMS, 2001) Surface Soil Sample
- PERIMETER OF CLEAN FILL
- CONCRETE
- ASPHALT

FIGURE 3.2					
D•E•M•S	U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT ATLAS MISSILE SITE No. 7 Composite Sample Locations Former Cooling Tower Location				
DESIGNED BY	E. PENN	12/13/01	CHECKED BY	J. PIONESSA	12/13/01
DRAWN BY	G. FLICK	12/13/01	APPROVED BY	J. PIONESSA	12/13/01
SCALE: NO SCALE	DRAWING NO. 002		SHEET NO. 2 of 3	REVISION NO. 00	



Note: Table 5.1 – Cross Reference Grid #'s With Sample ID #'s.

LEGEND

- ▲ ESI (MK, 2000) SURFACE SOIL SAMPLE LOCATIONS
- ■ BORE HOLE/MONITORING WELL LOCATION
- ◐ MONITORING WELL LOCATION
- ⊗ ESI (DEMS, 2001) Surface Soil Sample
- PERIMETER OF CLEAN FILL
- CONCRETE
- ASPHALT

FIGURE 3.3					
D·E·M·S	U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT ATLAS MISSILE SITE No. 7 Composite Sample Locations Forner UST Location				
DESIGNED BY	E. PENN	12/13/01	CHECKED BY	J. PIONESSA	12/13/01
DRAWN BY	G. FLICK	12/13/01	APPROVED BY	J. PIONESSA	12/13/01
SCALE: NO SCALE	DRAWING NO. 003		SHEET NO. 3 of 3	REVISION NO. 00	

Sixty-one soil-sampling locations were identified for this ESI Phase II. The sample locations were laid out in 10 ft. by 10 ft. grids using a 100 foot tape measure, wooden stakes, and string. Each grid was individually marked with a flag recording its unique grid number. Each grid number was assigned a unique sample identification number (see Table 5.1, Section 5 of this report).

In addition to the sixty one (61) composited grid samples, four discrete background soil samples were collected. Each background soil sample was analyzed for the eight (8) RCRA metals, zinc, and PCBs. The background sampling locations for the background soil samples are shown on the detailed site map **Appendix J**.

4.1.2 Sample Collection Methods – Surface Soils

Each individual grid was represented by one composite soil sample. The composite sample was comprised of five (5) discrete samples taken from different locations within each grid. Each grid was divided into quarters, one sample was taken from each quarter and from the center. This material was collected from the top six (6) inches of the surface soils and composited as a representative sample for that grid. The four background soil samples were collected as discrete samples from the top six (6) inches of the surface soils. Samples collected were free of debris, rocks, and vegetation. Each sample was collected using a stainless steel trowel or stainless steel core barrel, which was decontaminated between each sample collection. Soil sampling collection logs were prepared for each sample collected, describing soil type, sampled interval, sample identification numbers and corresponding grid numbers, dates and times, field screening information, and analysis requested (see **Appendix B**). Each sample was labeled and placed into the appropriate sample containers as specified by the laboratory. Sample containers were bubble wrapped and placed in padded coolers with ice to lower the temperature to 4 degrees C. A chain of custody for each sample was prepared documenting a unique sample identification number, date and time of collection, analysis requested, and identity of the person collecting each sample. Each completed chain of custody was placed in the shipping cooler. The coolers were sealed with custody seals and secured for shipping. Sampling locations were subsequently staked with pin flags or survey laths and clearly marked with each unique grid number or sample ID number. The staked sampling locations were then surveyed by a licensed survey company.

4.1.3 Groundwater Well Re-development

The existing groundwater wells at AMS No. 7 were redeveloped as required in the approved work plan and scope of work (SOW). Well development was accomplished using a submersible pump. Originally DEMS proposed that each well be surged before and between periods of pumping. Surging was not used during the redevelopment process of MW06, MW07, and MW08. After obtaining current static water levels, it was determined that the total casing volume was very small and the top of the static water column was well below the top of the screened interval in each well. It was recommended in the field and agreed to by the USACE field representative on site, that surging within the screened interval would not be completed due to the potential for damaging the screen. Instead, redevelopment of these three wells was accomplished with pumping only. All three wells were redeveloped using a 12-volt DC submersible electric pump. Both MW07 and MW08 pumped dry during redevelopment and exhibited very slow recharge rates. It was proposed in the approved work plan that redevelopment of MW09 would include a sand bailer to remove accumulated fill from the casing. A check of total well depth indicated no measurable fill had accumulated in this well. Redevelopment proceeded with pumping only. MW09 was redeveloped using a three quarter horsepower, 220-volt, three-inch diameter, submersible electric pump.

During well redevelopment activities, various water quality parameters were measured and recorded. These parameters included pH, temperature, conductivity, and turbidity. This information was then recorded on the Monitoring Well Development/Purging logs located in **Appendix C**.

Well redevelopment requires the following criteria be met:

- Minimum removal of three (3) times the standing volume in the well casing plus saturated annulus,
- Sediment thickness remaining in the well is less than 1 percent of the screen length (0.1 foot for screens 10 feet long).

- Measured water quality parameters are stabilized. Stabilization is reached after all parameters are stabilized for three successive readings. Three successive readings should be within plus or minus 0.2 for pH, plus or minus 1 degree Celsius for temperature, plus or minus 3% for conductivity, and plus or minus 10% for turbidity.

All instruments used to measure water quality parameters, were calibrated twice daily. The calibration results are recorded on the Calibration Logs located in **Appendix D**.

All of the criteria noted above were achieved except in the following wells:

- MW07
- MW09

In MW07 three (3) times the standing volume in the well casing plus saturated annulus calculated to only 8.83 gallons. This well pumped dry very easily and exhibited a very slow recharge rate. Development continued over a two day period with just over two well volumes, being recovered. Parameters were checked between each recharge event. All water quality parameters had stabilized, with the exception of turbidity, which was still dropping. A substantial decrease in turbidities had occurred during the two-day development period. Beginning turbidities that were above 990 ntu were reduced to below 15 ntu. Due to the extremely slow recharge rate of this well, the significant improvement in turbidity, and the stabilization of all remaining parameters, this well was accepted as developed.

MW09, the deep well, had a calculated three well volumes of 390 gallons including filter pack. This well pumped dry after producing only 142 gallons, approximately one well volume, and exhibited a very slow recharge rate. After initially pumping dry, MW09 was allowed to recharge for fifteen (15) hours. Additional pumping only recovered 60 gallons of water. The last three sets of parameter readings had almost reached stabilization. Turbidity which was above 990 ntu during the original well development had fallen to 7.59 ntu. Due to the extremely slow recharge rate of this well, the significant improvement in turbidity, and the near stabilization of all remaining parameters, this well was accepted as developed. Per the approved work plan, all wells were then allowed a stabilization period of 10 days before purging and sampling.

4.1.4 Low Flow Groundwater Sampling Activities

Before the start of groundwater sampling activities, plastic sheeting was placed on the ground surrounding each well. The plastic sheeting provided a clean work area, and prevented any cross contamination to sampling equipment. The air in the breathing zone and well casing was checked with a Photo Ionization Detector (PID) each time a well cap was removed to measure water level or collect a sample. No concentrations of organic vapors were recorded above background levels. All air-monitoring results are recorded on the Monitoring Well Sampling Collection Log for each well (**Appendix E**).

Purging and sampling were achieved using the Low-Flow Minimal Drawdown technique to minimize aeration and agitation of sediments in the well and formation. This sampling technique is based on parameter stabilization, not the number of well volumes removed. The Low Flow technique used in sampling the AMS No. 7 site is described below:

Low-flow ground water sampling was accomplished using a Sample Pro portable micro purge positive displacement bladder pump with Teflon tubing. Two pumps were used for this sampling event. Pumps were deconed immediately after removal and prior to placement into each monitoring well. The Teflon tubing used for each monitoring well was purchased new and only used once. Because of the very low well volumes in each well and the history of the wells pumping dry, all pumps were placed near the bottom of each well. Care was taken not to touch the bottom of the well with the bladder pump, due to the potential of disturbing well sediments. After placing the pump, each well was allowed to sit overnight to stabilize before purging or sampling. Waiting overnight allowed the well temperature and any disturbed sediments to stabilize. During well purging, flow rates were measured every two to three minutes using a graduated cylinder. This allowed for the maximum flow rate of <0.5 L/min to be maintained during the purging and stabilization process.

After purging and stabilization, ground water quality parameters were monitored in the field (real time) every 2 to 3 minutes during purging. These results were taken from an inline flow cell and field turbidity meter and recorded on the groundwater sampling forms for each individual well. Water quality field parameters used to indicate stabilization include temperature, pH, specific conductivity, turbidity, and dissolved oxygen. Stabilization was demonstrated with three successive field readings of temperature within +/- 0.5 degrees Celsius, +/- 0.01 pH, +/-3% specific conductivity, turbidity, and dissolved oxygen within +/- 10%. After the water quality parameters had stabilized within the EPA's recommended ranges, samples were collected. Sample collection occurred immediately after stabilization was established, regardless of well volumes removed. All readings obtained during purging, stabilization, and sampling information were recorded in the Monitoring Well Sampling Collection Log (**Appendix E**).

During Low-Flow purging and sampling, the water level within the well was monitored to ensure no excessive draw-down occurred. No excessive draw-down was observed in any of the wells sampled.

All instruments used to measure water quality parameters were calibrated twice daily. The calibration results are recorded on the Calibration Logs located in **Appendix D**.

4.1.5 Surveying and Mapping

All surface soil sample locations were surveyed upon completion of sampling activities. Horizontal coordinates were established relative to the Texas State Plane coordinate system. Surveys were connected to the coordinate system by third order, Class II control surveys. Horizontal coordinates were recorded to the nearest 0.1-foot. Survey coordinates for each sampling location and monitoring well location were recorded on a detailed site map, **Appendix J**.

Ground surface elevations were also shot at each location and recorded to the nearest 0.1 foot. Elevations will be referenced to the National Geodetic Vertical Datum of 1929

(NGVD of 1929) or the North American Vertical Datum, 1988 Adjustment (NAVD 88). Vertical surveys will be connected to datum by third order leveling. A licensed surveyor was used to perform the survey services.

4.1.6 IDW Waste Disposal

Waste generated during the ESI Phase II included decontamination water, monitoring well development water, and purge water. The water generated during he ESI was stored in a 500-gallon poly tank pending laboratory analysis.

Water sample results of the IDW confirmed the IDW to be non-hazardous. A licensed vacuum truck was used to remove the water from the poly tank and transported it to an Oklahoma Department of Environmental Quality licensed facility for disposal. All IDW transportation and disposal documentation is included in **Appendix F**.

5.0 Investigation Results

This section presents the results of this ESI Phase II. It includes the nature and extent of the contamination, and identifies the contaminants of potential concern (COPCs) in soils and groundwater.

5.1 Data Quality and Review

The laboratory analysis of the soil and groundwater samples collected during the ESI Phase II field activities underwent an independent third party data validation review. Reported undetected mercury in nineteen of the surface soil samples was qualified as unusable data due to unacceptably low method bias resulting in a 73% completeness for mercury in soils. All remaining data was determined to be 100% usable. Therefore the overall goal of 90% completeness has been met for data quality. The independent data validation review concluded that the analytical results generated during the ESI Phase II were of sufficient documented quality to determine the nature and extent of contamination. The data evaluated is adequate to assess the level of contaminates present for the purposes of risk assessment, determination of remedial alternatives, and/or further investigation. A copy of the Data Validation Report and all validated data is presented in **Appendix M**.

5.2 Surface Soils

A total of sixty-five (65) surface soil samples were collected and analyzed for the eight (8) RCRA metals, zinc and PCBs. All surface soil samples were collected from the upper six (6") inches of the surface soils. Sixty-one (61) of the samples were collected near areas of previous known releases based on prior site investigations. The remaining four soil sample locations were collected along the perimeter of the site boundaries to establish site soil background concentrations. **Figures 3.1, 3.2** and **3.3**, located in Section 4 of this report, address the specific surface areas sampled during this investigation. **Table 5.1**, below, details the surface soil sampling analytical results.

TABLE 5.1

Analytical Results For Surface Soil Samples

INCENERATOR

Grid #	Sample ID	Arsenic	Barium	Chromium	Lead	Zinc	PCBs	Units
I1	AMS07SS001	1.6	56.1	6.8	**34.4**	58.5	**.055**	mg/kg
I2	AMS07SS002	1.2	55.4	6.6	**34.9**	33.1	<.0200	mg/kg
I3	AMS07SS003	1.7	56.2	7.5	**16.2**	25.7	<.0200	mg/kg
I4	AMS07SS004	1.6	51.8	6.9	**10.6**	33.1	<.0200	mg/kg
I5	AMS07SS005	1.2	53.9	8.6	**10**	28	<.0200	mg/kg
I6	AMS07SS006	1.4	921	6.9	**104**	136	**.228**	mg/kg
I7	AMS07SS007	1.8	98	9.8	**288**	82.2	<.0200	mg/kg
I8	AMS07SS008	1.4	63.2	6.2	**38.4**	31.8	<.0200	mg/kg
I8	AMS07SS008QC	1.7	64.3	7.12	**39.4**	31.9	<.0200	mg/kg
I9	AMS07SS009	1.4	51.3	6.2	**15.3**	33.6	<.0200	mg/kg
I10	AMS07SS010	2.0	48.2	6.7	**14**	24.1	<.0200	mg/kg
I11	AMS07SS011	1.4	43.6	5.7	**10.4**	25	<.0200	mg/kg
I12	AMS07SS012	2.2	73.9	6.7	**64.5**	44.1	<.0200	mg/kg
I13	AMS07SS013	<1.000	47.9	5.1	**11.5**	24.6	<.0200	mg/kg
I14	AMS07SS014	1.6	73	9.4	**163**	88.4	<.0200	mg/kg
I15	AMS07SS015	1.4	84.6	8.3	**38.8**	62.4	<.0200	mg/kg
I16	AMS07SS016	<.969	73.6	7.6	**24**	40.1	<.0200	mg/kg
I17	AMS07SS017	<.978	49.2	5.7	**17.2**	22.3	<.0200	mg/kg
I18	AMS07SS018	.988B	46.1	5.1	**11.5**	27.1	<.0200	mg/kg
I18	AMS07SS018QC	<.956	43.1	6.2	**9.5**	29.2	<.0680	mg/kg
I19	AMS07SS019	1.4	55	7.3	**32.1**	35.3	<.0200	mg/kg
I20	AMS07SS020	1.6	73.4	7.2	**26.6**	33.6	<.0200	mg/kg
I21	AMS07SS021	NA	NA	NA	**NA**	NA	<.0200	mg/kg
I22	AMS07SS022	<.944	44.4	6.8	**21.9**	25.7	<.0200	mg/kg
I23	AMS07SS023	1.4	48.8	8.7	**12.2**	26.9	<.0200	mg/kg

COOLING TOWER

Grid #	Sample ID	Arsenic	Barium	Chromium	Lead	Zinc	PCBs	Units
C1	AMS07SS024	1.2	55.5	5.6	**6.6**	36J	<.0202	mg/kg
C2	AMS07SS025	<1.004	53.0	5.8	**4.6**	24.5J	<.0204	mg/kg
C3	AMS07SS026	1.0BJ	47.4	6.6	**4.0**	23.1J	<.0202	mg/kg
C4	AMS07SS027	1.2	43.8	6.9	**3.8**	21.2J	<.0202	mg/kg
C5	AMS07SS028	1.0BJ	36.8	6.3	**3.8**	50.6J	<.0202	mg/kg
C5	AMS07SS028QC	<.977	32.8	5.1	**3.3**	53.1J	<.0202	mg/kg
C6	AMS07SS029	1.2	89.8	7.2	**18.2**	89.4J	**.286**	mg/kg
C7	AMS07SS030	1.4	61.1	6.7	**9.3**	46.3J	<.0204	mg/kg
C8	AMS07SS031	1.0BJ	53.1	7.7	**4.8**	33.1J	<.0202	mg/kg
C9	AMS07SS032	1.2	46.9	7.3	**3.7**	21.1J	<.0202	mg/kg
C9	AMS07SS032QC	1.2	206	6.9	**3.7**	21.4	<.0202	mg/kg
C10	AMS07SS033	<1.033	41.1	5.4	**3.7**	19.8	<.0213	mg/kg
C11	AMS07SS034	<.962	32.5	3.5	**4.2**	17.9	<.0202	mg/kg
C12	AMS07SS035	1.2	38.8	5.8	**5.4**	50.1	**.082**	mg/kg
C13	AMS07SS036	2.3	97.1	11.3	**89.6**	221	**.395**	mg/kg
C13	AMS07SS036QC	1.8	98.6	11.6	**46.4**	216J	**.5J**	mg/kg
C14	AMS07SS037	1.9	96.3	13.4	**46.5**	131J	<.0206	mg/kg
C15	AMS07SS038	1.0BJ	47.4	6.4	**6.2**	52.2J	<.0202	mg/kg
C16	AMS07SS039	1.0BJ	53.5	6.7	**5.7**	46.5J	<.0202	mg/kg

Table 5.1 (continued)
COOLING TOWER

Grid #	Sample ID	Arsenic	Barium	Chromium	Lead	Zinc	PCBs	Units
C17	AMS07SS040	1.0BJ	40.8	7.0	**4.8**	67.5J	**.067J**	mg/kg
C18	AMS07SS041	1.6	80.5	9.8	**15.7**	144J	<.0204	mg/kg
C19	AMS07SS042	1.4	74.9	10	**13.9**	89.4J	.046	mg/kg
C20	AMS07SS043	1.4	69.2	5.8	**18.0**	76.8	<.0204	mg/kg
C21	AMS07SS044	1.0	58.3	6.7	**4.5**	28.0	<.0202	mg/kg
C22	AMS07SS045	1.2	42.5	5.2	**3.7**	19.0	<.0202	mg/kg
C23	AMS07SS046	<1.008	36.1	5.8	**5.0**	82.5	<.0202	mg/kg
C24	AMS07SS047	1.6	99.3	10.4	**54.0**	365.0	**.115**	mg/kg
C25	AMS07SS048	1.6	66.5	6.4	**7.0**	34.5	<.0202	mg/kg
C26	AMS07SS049	1.4	62.8	7.8	**5.8**	43.4	**.298**	mg/kg
C27	AMS07SS050	<.972	39.2	6.2	**7.3**	120.2	<.0202	mg/kg
C27	AMS07SS050QC	<.996	33.1	5.0	**6.6**	108J	<.0202	mg/kg
C28	AMS07SS051	1.8	84.5	10.1	**58.6**	346.1	<.0202	mg/kg
C29	AMS07SS052	1.8	74.1	7.0	**15.8**	66.1	<.0202	mg/kg
C30	AMS07SS053	1.4	61.1	9.1	**9.1**	67.3	.024	mg/kg

FORMER UNDERGROUND STORAGE TANK AREA

Grid #	Sample ID	Arsenic	Barium	Chromium	Lead	Zinc	PCBs	Units
U1	AMS07SS054	1.7	69.8	10.2	**12.9**	34.8	.045J	mg/kg
U2	AMS07SS055	1.5	69.9	12.0	**22.1**	40.4	**.170**	mg/kg
U3	AMS07SS056	1.4	66.2	9.1	**10.9**	38.5	<.1010	mg/kg
U4	AMS07SS057	1.3	82.3	12.3	**30.6**	34.8	<.1010	mg/kg
U5	AMS07SS058	1.4	71.8	10.3	**40.8**	35.4	<.1010	mg/kg
U6	AMS07SS059	1.8	55.8	7.0	**13.3**	26.8	<.1010	mg/kg
U6	AMS07SS059QC	1.9	59.1	8.4.0	**11.9**	26.4	<.1010	mg/kg
U7	AMS07SS060	1.8	75.9	12.3	**37.2**	48.2	**.065**	mg/kg
U8	AMS07SS061	1.0	64.4	7.0	**7.0**	30.8	<.0202	mg/kg

BACKGROUND

	Sample ID	Arsenic	Barium	Chromium	Lead	Zinc	PCBs	Units
	AMS07SS062	1.4	35.7	60.5	**3.3**	16.2	<.0202	mg/kg
	AMS07SS063	1 BJ	19.9	3.6	**1.7**	<9.56	<.0200	mg/kg
	AMS07SS064	<.990	26.3	3	**2.8**	10.5	<.0202	mg/kg
	AMS07SS065	<.990	27.5	4.6	**3**	11.1	<.0202	mg/kg

ND – Non Detect
NA – Not Available
J – Estimated
Bold/ Shaded – Exceeds the Screen Level for Groundwater Protection (GWP) RRS-II MSC

The highlighted lead and PCB concentration on the preceding table all exceeded the residential Groundwater Protection (GWP) levels for soils as listed on the RRS-II MSC found in **Appendix G**.

Only two surface soil samples detected metals other than the metals indicated above. Sample number AMS07SS035 located in Grid C12, detected mercury at 0.153 mg/kg. Sample number AMS07SS051 located in Grid C28 detected cadmium at 0.402 mg/kg. The mercury detected in sample number AMS07SS035 is below the MSC of 6.1 mg/kg soils residential and 0.2 mg/kg for GWP residential. The cadmium detected in sample number AMS07SS051 is below the MSC of 1400 mg/kg soils residential and 0.5 mg/kg for GWP residential. **Table 5.2** below lists the RRS-II MSC screen levels for both soil GWP and residential, for the eight RCRA metals, zinc and PCBs.

Table 5.2

TNRCC RRS-II Residential and GWP Residential Screening Values Eight (8) RCRA Metals and Zinc

Analyte	GWP Screening Level mg/kg	Soil Residential Screening Level mg/kg
Arsenic	5	20
Barium	200	9100
Cadmium	0.5	1200
Chromium	10	53000
Mercury	0.2	6.1
Lead	1.5	500
Silver	18	460
Selenium	5	1300
Zinc	1100	5900
PCBs	.05	10

It is reported in the independent data validation report that undetected mercury in sample numbers AMS07SS025 through 032, SS036QC through 043, SS050, and SS050QC was qualified as unusable data due to unacceptably low method bias. This does not suggest that mercury should have been detected, only that the non-detect readings are bias low. This is probably due to soil matrix interference. Mercury had not been identified in previous site investigations as a COPC. Non-rejected mercury concentrations are below action levels for soils residential and GWP residential. Therefore mercury is not considered a primary COPC.

Only the detected concentration of lead and PCBs highlighted on **Table 5.1** exceeded any of the screening levels for both soils and GWP residential under RRS-II MSC found in **Appendix G.** No other analyite for soils exceeded screen levels for RRS-II MSC residential.

5.2.1 Comparison To Previous Site Investigations - Surface Soil Sampling

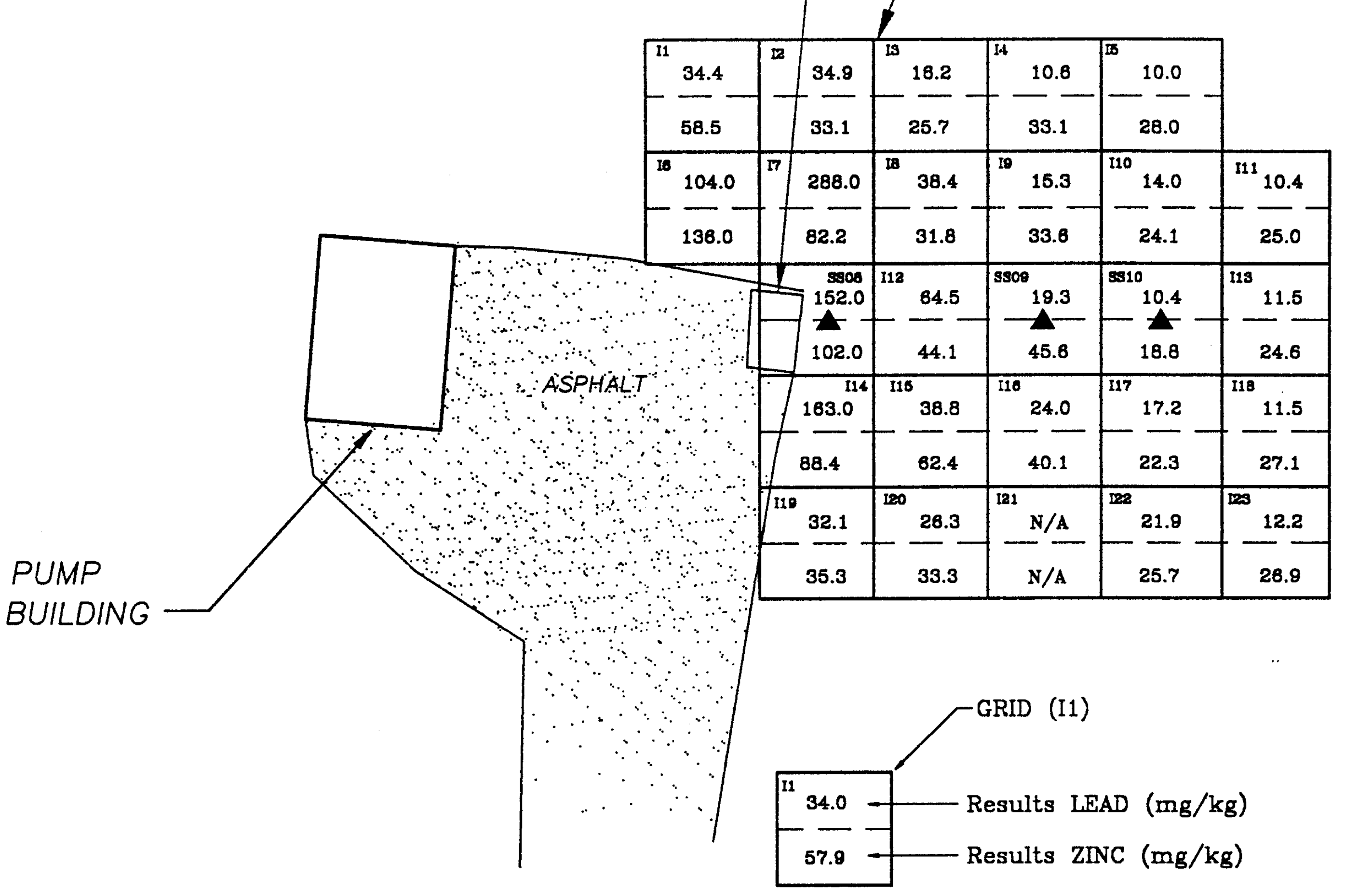
Previous surface soil analytical results, as presented in Section 3 of this report, indicated lead, zinc, and PCB contamination near the original locations of the incinerator, cooling tower, and UST. Analytical results for lead and zinc were compared, by MK in their ESI 2001 final report, to the Texas Specific Background Concentrations (Interoffice memorandum dated June 28, 2000). This memorandum lists background concentrations for lead at 15 mg/kg and zinc at 30 mg/kg. Several soil samples collected and analyzed during the MK ESI detected lead and zinc levels in excess of the Texas Specific Background Concentrations, causing MK to list them as primary COPCs. However, the Texas Specific Background Concentration levels of 15 mg/kg for lead and 30 mg/kg for zinc do not represent screening values or clean-up levels, but only suggested background values. The metal concentrations reported in the MK ESI final report should have been compared to MSC RRS-II soil screening levels for residential use of 500 mg/kg for lead, and 59000 mg/kg for zinc.

Analytical results from surface soil sampling conducted during this ESI Phase II did confirm elevated levels of lead, zinc, and some PCBs surrounding the incinerator, cooling tower, and UST. All three COPC maximum concentrations were below the MSCs RRS-II soil screening levels for residential use of 500 mg/kg for lead, 59000 mg/kg for zinc and 10 mg/kg for PCBs. **Figures 3.1A**, **3.2B**, and **3.3C** show the grid sampling locations for lead and zinc concentrations detected during this ESI Phase II investigation.

Lead, Zinc and PCB Background Concentrations			
	Average	High	Low
LEAD	2.7 mg/kg	3.3 mg/kg	1.7 mg/kg
ZINC	9.45 mg/kg	16.2 mg/kg	0 mg/kg
PCBs	<.0202 mg/kg	<.0202 mg/kg	<.0202 mg/kg

Detected PCB concentrations/Grid location

Grid No.	PCB concentrations (mg/kg)
I1	0.055
I6	0.228



Note: Table 5.1 – Cross Reference Grid #'s With Sample ID #'s.

N/A – Laboratory Results Not Available

LEGEND

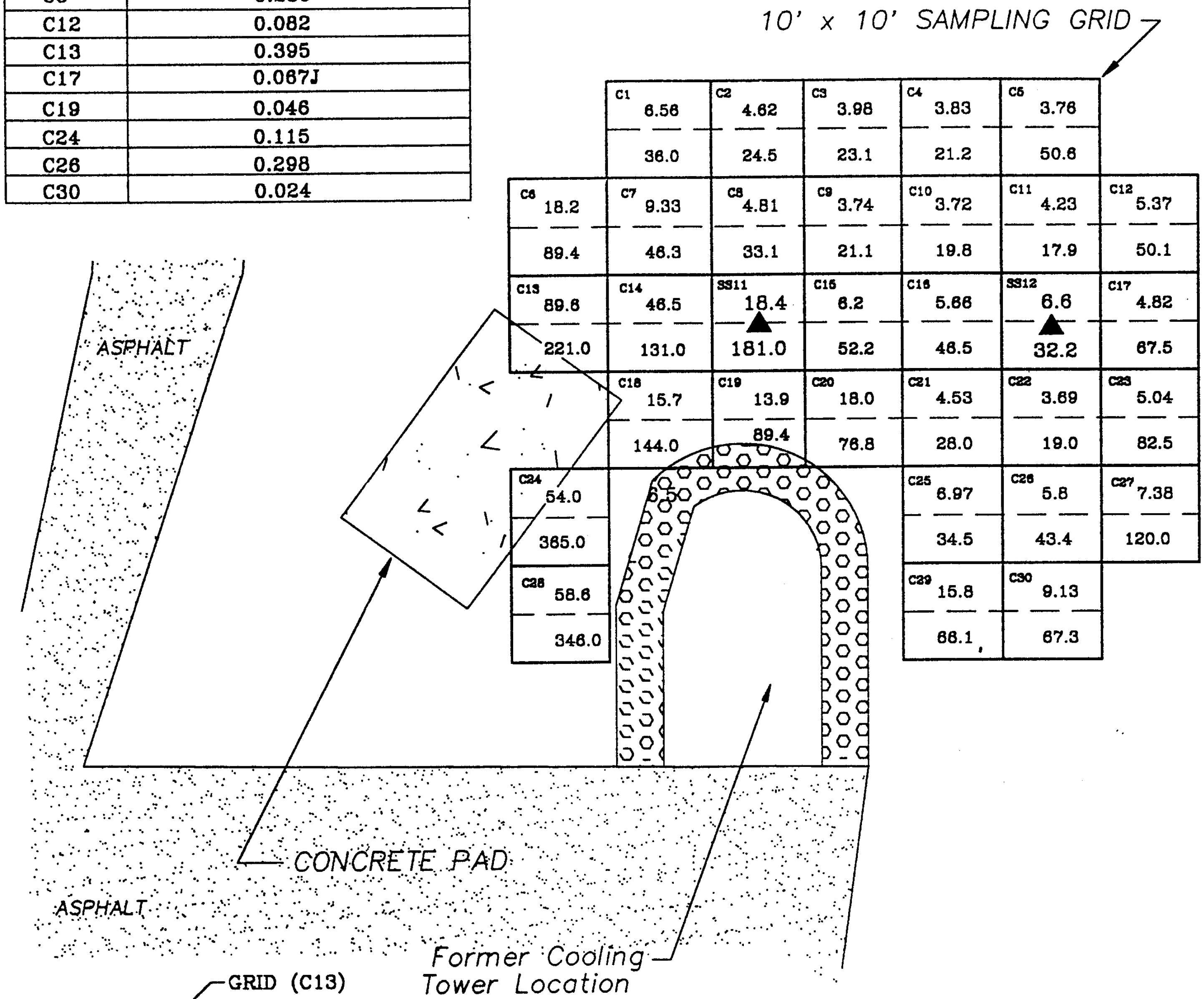
- ▲ ESI (MK, 2000) SURFACE SOIL SAMPLE LOCATIONS
- PERIMETER OF CLEAN FILL
- CONCRETE
- ASPHALT

FIGURE 3.1A					
D·E·M·S	U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT ATLAS MISSILE SITE No. 7 Results Incinerator Sampling Grid Vernon, TX				
DESIGNED BY	E. PENN	01/29/02	CHECKED BY	J. PIONESSA	01/29/02
DRAWN BY	G. FLICK	01/29/02	APPROVED BY	J. PIONESSA	01/29/02
SCALE: NO SCALE	DRAWING NO. 001		SHEET NO. 1 of 3	REVISION NO. 01	

Detected PCB concentrations/Grid location

Grid No.	PCB concentrations (mg/kg)
C6	0.286
C12	0.082
C13	0.395
C17	0.067J
C19	0.046
C24	0.115
C26	0.298
C30	0.024

Lead, Zinc and PCB Background Concentrations			
	Average	High	Low
LEAD	2.7 mg/kg	3.3 mg/kg	1.7 mg/kg
ZINC	9.45 mg/kg	16.2 mg/kg	0 mg/kg
PCBs	<.0202 mg/kg	<.0202 mg/kg	<.0202 mg/kg



GRID (C13)

C13	
89.6	Results LEAD (mg/kg)
221.0	Results ZINC (mg/kg)

Note: Table 5.1 – Cross Reference Grid #'s With Sample ID #'s.

LEGEND

- ▲ ESI (MK, 2000) SURFACE SOIL SAMPLE LOCATIONS
- PERIMETER OF CLEAN FILL
- CONCRETE
- ASPHALT

FIGURE 3.2A

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT

D•E•M•S

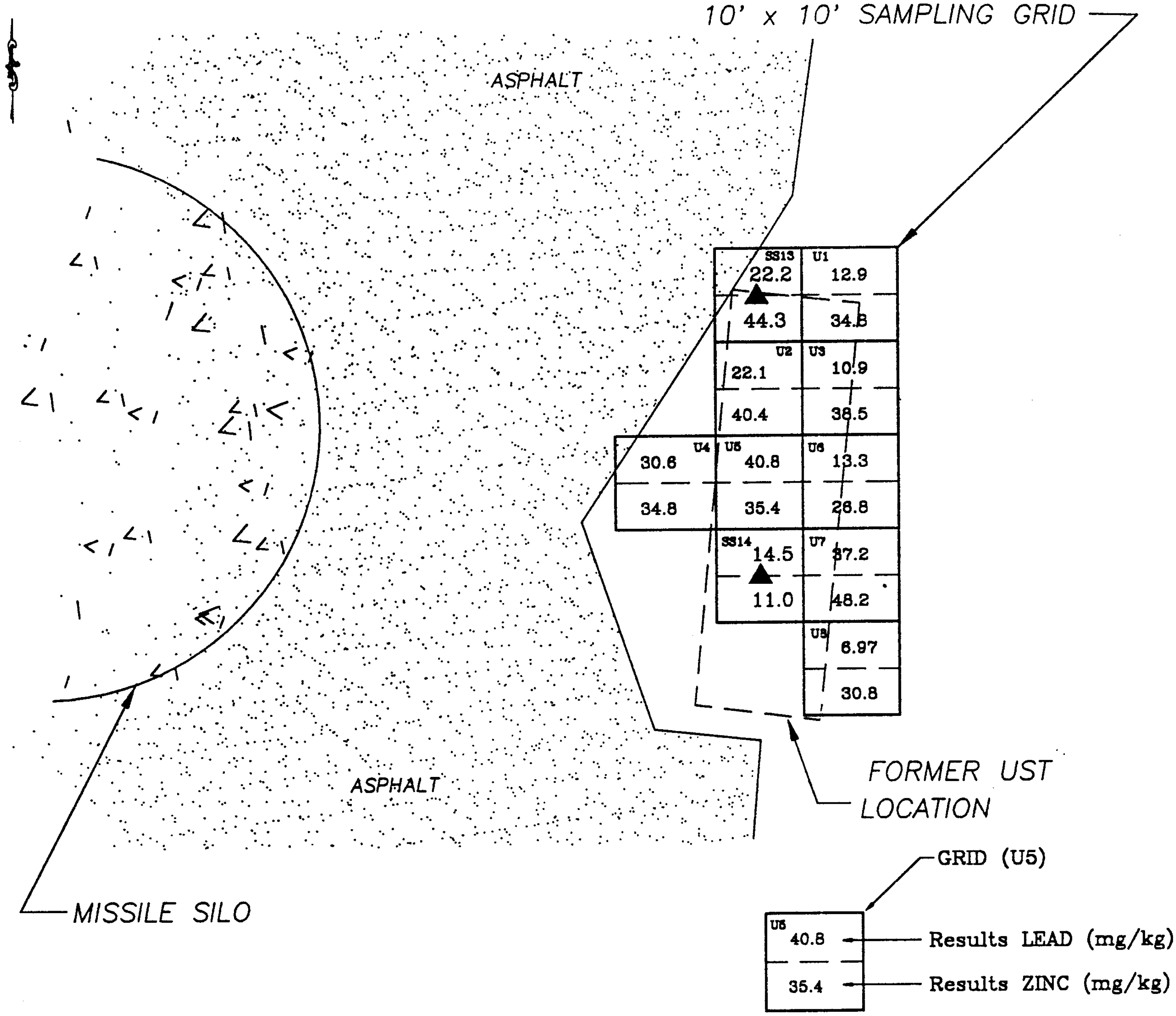
ATLAS MISSILE SITE No. 7
Results Cooling Tower Sampling Grid
Vernon, TX

DESIGNED BY	E. PENN	01/29/02	CHECKED BY	J. PIONESSA	01/29/02
DRAWN BY	G. FLICK	01/29/02	APPROVED BY	J. PIONESSA	01/29/02
SCALE: NO SCALE	DRAWING NO. 002	SHEET NO. 2 of 3	REVISION NO. 01		

Detected PCB concentrations/Grid location

Grid No.	PCB concentrations (mg/kg)
U1	0.045J
U2	0.170J
U7	0.065

Lead, Zinc and PCB Background Concentrations			
	Average	High	Low
LEAD	2.7 mg/kg	3.3 mg/kg	1.7 mg/kg
ZINC	9.45 mg/kg	16.2 mg/kg	0 mg/kg
PCBs	<.0202 mg/kg	<.0202 mg/kg	<.0202 mg/kg



Note: Table 5.1 – Cross Reference Grid #'s With Sample ID #'s.

LEGEND

- ▲ ESI (MK, 2000) SURFACE SOIL SAMPLE LOCATIONS
- PERIMETER OF CLEAN FILL
- CONCRETE
- ASPHALT

FIGURE 3.3A

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT

D•E•M•S

ATLAS MISSILE SITE No. 7
Results UST Sampling Grid
Vernon, TX

DESIGNED BY	E. PENN	01/29/02	CHECKED BY	J. PIONESSA	01/29/02
DRAWN BY	G. FLICK	01/29/02	APPROVED BY	J. PIONESSA	01/29/02
SCALE: NO SCALE	DRAWING NO. 003		SHEET NO. 3 of 3	REVISION NO. 01	

5.3 Groundwater

Goundwater samples were collected and analyzed for the eight (8) RCRA metals, zinc, VOCs, SVOCs, Pesticides/PCBs, Herbicides, and TPH from the four (4) groundwater monitoring wells on site. The water samples collected consist of three samples from the Seymour Aquifer (MW06, 07, 08) and one from the underlying San Angelos Aquifer (MW09). **Table 5.3**, below, details the monitoring well sampling and analytical results for all detected analytes.

Table 5.3

Groundwater Analytical Results Monitoring Wells

Analytical Suite/ Analyte	MW06	MW07	MW08	MW09	MW09QC
Metals (mg/l)					
Barium	.181	.336	.528	.049	.045
Cadmium	.002	<.0010	<.0010	.002	.003
Chromium	.011	<.0050	<.0050	.01	.014
Silver	.011	<.0050	<.0050	<.0050	<.0050
VOCs (mg/l)					
Cis-1,2- Dichloroethene	<.0020	<.0020	**.0514**	<.0020	<.0020
Trans- 1,2- Dichloroethene	<.0020	<.0020	**.0026**	<.0020	<.0020
Trichloroethene	<.0020	<.0020	**.139**	<.0020	<.0020
Toluene	<.0020	<.0020	.0028J	.0028J	.0025

ND – Non Detect
Bold – Results above MSCs Groundwater Residential RR Standard No. 2

No other VOC, SVOC or metals were reported above detection limits. Samples were also non-detect for Pesticides/PCBs, Herbicides and TPH.

5.3.1 Comparison To Previous Site Investigations - Monitoring Wells

5.3.1.1 Metals

Four metals were detected, barium, cadmium, chromium, and silver during the ESI Phase II. All metal concentrations are below MSCs for TNRCC RRS-II groundwater residential. All other metal results were below the laboratory detection limits. **Table 5.2.1** lists all metals above detection limits as reported in the MK ESI 2001 final report and detected during this ESI Phase II.

5.3.1.2 VOC's – Water Samples

Only four VOC's compounds were detected in water samples collected during this ESI Phase II. Cis-1,2- Dichloroethene, Trans-1,2- Dichloroethene, and Trichloroethene, were detected in MW08. Toluene was detected in MW08 and MW09. **Table 5.2.1** compares all detected concentrations for VOC compounds with the previous sampling events. This table also reports the MSCs action levels for each compound. These action levels were taken from the RRS-II-Res. (**See Attachment G**).

Trichloroethene is the only compound detected above the MSC action level for residential groundwater. Five VOC compounds, 1,1-Dichloreoethylene, acetone, chloroform, 4-Isopropyltoluene, and Vinyl Chloride identified in the MK ESI 2001 final report were not detected in this ESI Phase II.

5.3.1.3 SVOCs

The SVOC compound, Bis (2-ethylhexyl) phthalate was detected in MW08 as reported in the MK ESI 2001 final report. No SVOCs including Bis (2-ethylhexyl) phthalate were detected in the samples collected and analyzed during this ESI Phase II.

Table 5.3.1.3

Groundwater
Comparison Between MK Jan. 2001 Analytical Results with DEMS Dec. 2001 Results
All Detected Analytes

All units in – mg/l									
	MW06		MW07		MW08		MW09		
Analytical Suite/ Analyte	MK Jan. 2001 Report	DEMS Dec. 2001 Report	MK Jan. 2001 Report	DEMS Dec. 2001 Report	MK Jan. 2001 Report	DEMS Dec. 2001 Report	MK Jan. 2001 Report	DEMS Dec. 2001 Report	MCS Action Levels Residential
Metals									
Antimony	<.0002	N/A	<.0002	N/A	.001	N/A	<.001	N/A	.006
Barium	.200	.181	.410	.336	.32	.528	.260	.049	2.0
Cadmium	ND	.002	ND	<.001	ND	<.001	ND	.002	.005
Chromium	.012	.011	.015	<.005	.0083	<.005	.0013	.01	.1
Copper	.007	N/A	.010	N/A	.0041	N/A	.0043	N/A	1.3
Lead	.014	<.003	.0068	<.003	<.0005	<.003	<.0025	<.003	.015
Nickel	.012	N/A	.0182	N/A	.0087	N/A	.100	N/A	.73
Silver	ND	.011	ND	<.005	ND	<.005	ND	<.005	.18
VOCs									
Acetone	ND	<.05	N/D	<.05	.0087	<.05	N/D	<.05	3.7
Chloroform	<.0001	<.002	<.0001	<.002	.0005	<.002	<.0001	<.002	.1
1,1-Dichloroethene	<.0002	<.002	<.0002	<.002	.0003	<.002	<.0002	<.002	.007
4-Isopropyltoluene	<.0001	<.002	<.0001	<.002	.0001	<.002	<.0001	<.002	*
Cis-1,2- Dichloroethene	<.0001	<.002	<.0001	<.002	.030	.0514J	<.0001	<.002	.07
Trans-1,2- Dichloroethene	<.0001	<.002	<.0001	<.002	.0028	.0026J	<.0001	<.002	.1
Trichloroethene	<.0001	<.002	<.0001	<.002	**.140**	**.139J**	<.0001	<.002	.005
Toluene	N/D	<.002	N/D	<.002	N/D	.0028J	N/D	.0028J	1
Vinyl Chloride	<.0002	<.002	<.0002	<.002	.0002	<.002	<.0002	<.002	.002
SVOCs									
Bis(2-ethylhexyl)phthalate	<.0006	<.01	<.0006J	<.01	1.0J	<.01	1.3J	<.01	*

MSCs action levels from Texas Risk Reduction, Standard No. 2, Appendix G
J - Estimated
ND – Non Detect N/A – Not Analyzed * - No action level provided
Bold/Shaded – Results above MSCs Groundwater Residential RR Standard No. 2

6.0 Executive Summary

This section summarizes the fieldwork, COPCs, and nature and extent of contamination defined by this ESI Phase II.

6.1 Field Sampling and COPCs

6.1.1 Soil

Previous site investigations indicated lead, zinc, and PCBs as the primary COPCs for surface soils. Potential areas for release were identified as the former sites for the cooling tower, incinerator, and UST. A total of sixty-one (61) surface soil samples were collected and analyzed for the eight (8) RCRA metals, zinc, and PCBs. Additionally, four (4) soil samples were collected and analyzed for the eight (8) RCRA metals, zinc, and PCBs to establish background concentrations. The average background results are presented in **Table 6.1.1** below.

Table 6.1.1
Average Background Concentrations

Analyte	Average	High	Low	Texas Specific Background Concentrations
Arsenic	.6 mg/kg	1.4 mg/kg	0 mg/kg	5.9 mg/kg
Barium	27.35 mg/kg	35.7 mg/kg	19.9 mg/kg	300 mg/kg
Chromium	4.3 mg/kg	6 mg/kg	3 mg/kg	30 mg/kg
Lead	2.7 mg/kg	3.3 mg/kg	1.7 mg/kg	15 mg/kg
Zinc	9.45 mg/kg	16.2 mg/kg	0 mg/kg	30 mg/kg
PCBs	<.0202	<.0202	<.0202	N/A

Texas Specific Background Concentrations – **Appendix H**
N/A – Not Available

Site specific background results are all lower then the Texas Specific Background Concentrations as indicated on **Table 6.1.1**. To achieve closure of this site under RRS-1, all detected soils metal concentrations would be required to be at or below the site specific background concentrations. This would require a significant amount of soil removal. It is recommended that site closure be preformed under RRS-II Res. concentrations as indicated in **Appendix G**.

On site surface soil sample results confirmed, the previous site investigations conclusion, that lead, zinc, and PCBs are above background levels and should be considered the primary COPCs for surface soils. Analytical results for all metals tested are below the soil RRS-II MSC levels for residential. However, all lead and several sample locations for PCBs detected concentrations exceeding the RRS-II MSC GWP values for soils residential.

6.1.2 Groundwater

Water samples were collected from the three shallow monitoring wells and one deep well and analyzed for the 8 RCRA metals, zinc, VOCs, SVOCs, Pesticides/PCBs, Herbicides, and TPH. The primary COPCs reported in the MK ESI 2001 final report were Acetone, Chloroform, 1,1-Dichloroethylene, 4- Isopropyltoluene, Cis-1,2-Dichloroethene, Trans-1,2-Dichloroethene, Trichloroethene, and Vinyl Chloride all confined to MW08, with the exception of Vinyl Chloride which was also found in MW09. Only, four (4) VOC compounds were detected during this ESI Phase II sampling event. The four (4) VOC compounds are; Cis-1,2-Dichloroethene, Trans-1,2-Dichloroethene, Trichloroethene, and Toluene. All four compounds are present in MW08. Toluene is also present in MW09. Only Trichloroethene is above the TNRCC RRS-II-Res MSC screening value of .005 mg/l for residential. Cis-1,2-Dichloroethene and Trans-1,2-Dichloroethene, detected in MW08, were below the TNRCC RRS-II-Res MSC screening values of .07 mg/l for Cis-1,2-Dichloroethene and .1 mg/l for Trans-1,2-Dichloroethene. Toluene concentrations in MW08 and MW09 were below the MSC screening value of 1 mg/l for TNRCC RRS-II-Res. No SVOCs, Pesticides/PCBs, Herbicides, or TPH were detected in any of the monitoring wells sampled during this ESI Phase II.

6.2 Nature and Extent of Contamination

Surface soil sampling around the incinerator, cooling tower, and former UST site detected lead, zinc, and PCBs in excess of the established background concentrations. It is clear from the samples collected during this ESI Phase II that the incinerator, cooling tower, and former UST site are probable sources of contamination. Sampling results confirmed higher concentrations closer to the established source and decreasing concentrations as one moves away from the source. Background samples taken from around the site perimeter demonstrates no surface contamination is moving offsite. The surface soil analytical results presented in **Figures 3.1A, 3.2A, and 3.3A** show the extent of the surficial contamination is very limited in extent.

Groundwater analytical results detected trichloroethene in MW08 above the MSC screening values for residential use. One well is not sufficient to determine the extent or potential source of contamination for the trichloroethene detected in the shallow Seymour aquifer.

7.0 Recommendations

Based on the data gathered during this ESI Phase II and upon regulatory compliance review, the following recommendations for the former AMS No. 7 site are presented below. The recommendations for additional fieldwork and groundwater investigation listed below have also incorporated the comments and suggested/requested actions by the TNRCC in a letter dated September 24, 2001 to the USACE, Tulsa District. (**Attachment I**).

- Contamination has been identified and confirmed surrounding the incinerator, cooling tower, and former UST site. COPCs are lead, zinc, and PCBs, however none of the COPCs exceed the RR Standard 2 soil screening levels for residential use. Many of the soil sample results do exceed the values established for RR Standard 2 GWP. Therefore, further investigations need to be conducted to establish GWP. In the TNRCC letter dated September 24, 2001 they suggest leachate tests be conducted to determine site-specific soil to GWP values, in accordance with Texas Administrative Code Title 30 Part1 Chapter 335 Subchapter S Rule 335.559 subsection (g). Subsection (g) is based upon the original MK report that this site be closed as industrial. It has been recommended in this report that the site closure be based upon residential standards, so subsection (f) of the above referenced Texas Administrative Code should be applied. In particular subsection (f) (2) which defines the procedures required to meet GWP, "a concentration in soil that does not produce a leachate in excess of MCLs or MSCs for groundwater when subjected to the Synthetic Precipitation Leaching Procedure, Method 1312 of SW 846". Surface and shallow subsurface soil samples should be collected and analyzed for the total lead, zinc, and PCBs., along with leachate tests using the SPLP Method 1312. Samples should be collected from each boring at the surface, at two feet below surface and at three feet below surface. A total of four soil borings should be preformed at each identified source of contamination: incinerator, cooling tower, and former UST site. One soil boring should be located within the area of highest concentrations for each identified area. Three additional borings should be located down surface gradient of the highest concentrations boring. Combining this new subsurface and leachate information with the current surface information, a detailed interpretation of both the horizontal and vertical extent of the metals contamination can be derived. Additionally, surface soil sampling should be preformed in areas where there is the potential for water run-off to determine if COPCs are being transported offsite. These surface samples should be tested for total lead, zinc, and PCBs.

- Additional ground water monitoring wells need to be installed up gradient and down gradient of MW08 to determine the down gradient extent and potential source of the TCE contamination in the Seymour aquifer and to comply with the recommendations of the TNRCC. These wells need to be drilled to a sufficient depth to adequately test the shallow aquifer estimated at 40 feet bgs. Subsurface soil samples should be collected from the boring of the monitoring wells. Samples should be collected at five (5) foot intervals or key stratum changes with a maximum of six (6) samples collected from each boring. Subsurface soil samples collected should be analyzed for the eight (8) RCRA metals, zinc, VOCs, SVOCs, pesticides/PCBs, herbicides, and TPH. Groundwater collected should be analyzed for the (8) RCRA metals, zinc, VOCs, SVOCs, pesticides/PCBs, herbicides, and TPH

- Perform a well survey of all wells located within one half mile of the site. The survey should included location, well owners, well construction details (if available), total depth of well and screened interval, producing aquifer, current status of the well, and usage or type of well. The well survey shall include a map showing the wells locations.

- Currently MW09 is the only groundwater monitoring well installed in the deep aquifer (San Angelos Formation). It was noted in the TNRCC September 24, 2001 letter to the USACE, Tulsa District, that to provide significant conclusions regarding the potential for releases from the bottom of the silo, a deep well must be installed directly down gradient to the silo. MW09 is probably not currently located directly down gradient from the silo. Therefore, it is DEMS's and TNRCC's recommendation that a new well be drilled in the deep aquifer (San Angelos Formation), to an approximate depth of 200 feet, down gradient to the silo. Gradient direction can be approximated using existing geologic and hydrogeologic literature. Groundwater from this well should be tested for the eight (8) RCRA metals, zinc, VOCs, SVOCs, pesticides/PCBs, herbicides, and TPH. This will provide additional groundwater information from the deep aquifer in relationship to potential releases form the silo.

- The TNRCC, in there response letter dated September 24, 2001 to USACE, Tulsa District (**Attachment I**) regarding Comments and Notice of Deficiency for the MK ESI 2001 final report, requested immediate action on the following items:
    - a) Immediately sample any water supply wells on the site or directly down gradient of the site.
    - b) Report groundwater sampling results to the TNRCC within 7 days of receipt of the laboratory results. This reporting requirement will continue until further notice from the TNRCC.
    - c) Immediately begin quarterly groundwater sampling of the existing wells.
    - d) The TNRCC suggested that further analysis of groundwater should be limited to analytes previously detected in soils and groundwater and their degradation products.

Past investigative surveys have recommended that the AMS No. 7 be classified as an industrial site. Based upon the concentrations and types of COPCs identified in this ESI Phase II, there is no advantage to classifying this site as industrial. Closure can be meet using the residential RR standard II screening levels.

8.0 References

The following references were utilized in the preparation of this report.

American Society for Testing Materials (ASTM), 1990. Standards Practice for Description and Identification of Soils (Visual-Manual Procedure). ASTM D-2488-90.

Morrison Knudsen (MK), *Expanded Site Investigation Report, Former Atlas Missile Site No. 7, Vernon, Texas*, prepared for the U.S. Army Corps of Engineers (USACE), Tulsa District. (January 2001).

Texas Natural Resource Conservation Commission (TNRCC), 1999, Chapter 335-Industrial Solid Waste and Municipal Hazardous Waste, Subchapter S.

EPA, 1996. *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures,* in Ground Water Issue, EPA/540/S-95/504 (April)

Price, R.D., 1979. *Occurrence, Quality and Quantity of Ground Water in Wilbarger County, Texas*, Report 240, published by Texas Department of Water Resources (November).

Willis, G.W., and Knowles, 1953. *Ground-Water Resources of the Odell Sand Hills, Wilbarger County, Texas*, published by the Texas Board of Water Engineers (January).

Appendix A

Site Photographs

Instrument calibration

MW08 Redevelopment – Electric pump run from truck battery.

Pulling ¾ horse electric pump from MW09.

MW08 & MW09 – Poly tank for temporary storage of development water.

Low flow groundwater monitoring well sampling.

String used to mark grid boundary for surface soil sampling. Red Flag marks approximate center of grid

Stakes used to mark grid corners for surface soil sampling.

Surface being cleared of vegetation prior to surface soil sample collection.

Composite grid surface soil sample homogenized and Ready for placement in sample containers.

Placing field weighed five (5) gram soil sample into sample container for VOA analysis.

Decontamination of sampling equipment between samples.

Survey crew locating key site features, groundwater monitoring well and surface soil sampling location.

Appendix B

Soil Sample

Collection Logs

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS001

Date (YYMMDD): 09-25-01
Time (HHMMSS): 9:59
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon Penn
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM - Tan lt brown, sand, subrounded - subangular, silty, some gravel, rounded to angular

Taken from Grid I1

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D·E·M·S

SOIL SAMPLE COLLECTION LOG

Project No.:	2075
Site:	AMS #7
Sample ID:	AMS07SS002
Date (YYMMDD):	09-25-01
Time (HHMMSS):	10:11
Top Depth:	0"
Bottom Depth:	6"
Matrix:	Soil
Sample Qualifier:	QA / QC / RB / CS
Sample Type:	Grab / (Comp) / NA
Sampler:	Eldon
Witness:	
Contractor:	DEMS

Remarks:

Soil Description

SM - Tan - lt brown sand, subrounded to subangular, silty, some gravel, rounded to angular

Taken from grid I2

Weather:

Prepared By: [signature]

Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: Ams #7

Sample ID: AMS0755003

Date (YYMMDD): 04-25-01
Time (HHMMSS): 10:19
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM- Tan to lt brown, sand, subrounded to subangular, silty, some gravel, rounded to angular

Taken from grid I3

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A, Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D▪E▪M▪S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS004

Date (YYMMDD): 09-25-01
Time (HHMMSS): 10:22
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM- Tan to lt brown, sand, subrounded - subangular, silty, some gravel, rounded to angular

Taken from Grid I4

Weather:

Prepared By: Elden [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D▪E▪M▪S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS005

Date (YYMMDD): 09-25-01
Time (HHMMSS): 10:28
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM- Tan to lt brown, sand, subrounded - subangular, silty, some gravel, rounded to angular.

Taken from Grid I5

Weather:

Prepared By: Elden [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS006

Date (YYMMDD): 01-25-01
Time (HHMMSS): 10:32
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elder
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM - Tan to lt brown, sand, subrounded to subangular, silty, some gravel, rounded to angular

Taken from Grid I6

Note! Sharp increase in rock - rounded

Weather:

Prepared By: Elder [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS007

Date (YYMMDD): 04-25-01
Time (HHMMSS): 10:56
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM - Tan to lt brown, sand, subrounded to subangular, silty, some gravel, rounded to angular

Taken from Grid I7

Note! Surface soil contains high % rounded rock and angular limestone road bed material

Weather:

Prepared By: Elden P[illegible]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS008 + SS008QC
Date (YYMMDD): 09-25-01
Time (HHMMSS): 11:27
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM- Tan to lt brown, sand, subrounded to subangular silty, some gravel, rounded to angular

Taken from Grid IB

Note: High % limestone road bed material

Weather:

Prepared By: Elden [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.:	2075
Site:	AMS #7
Sample ID:	AMS07SS009
Date (YYMMDD):	09-25-01
Time (HHMMSS):	11:25
Top Depth:	0"
Bottom Depth:	6"
Matrix:	Soil
Sample Qualifier:	QA / QC / RB / CS
Sample Type:	Grab / (Comp) / NA
Sampler:	Elder
Witness:	
Contractor:	DEMS

Remarks:

Soil Description

SM - Tan to lt brown, sand, subrounded to subangular, silty, some gravel, rounded to angular.

Taken from grid I9

Weather:

Prepared By: Elder P[illegible]

Checked By:

Analytical Request			
Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results	
Reading	Time
0.00	

D▪E▪M▪S

Page 1 of 1

SOIL SAMPLE COLLECTION LOG

Project No.: 2075	
Site: AMS #7	
Sample ID: AMS07SS010	
Date (YYMMDD): 09-25-01	
Time (HHMMSS): 11:27	
Top Depth: 0"	
Bottom Depth: 6"	
Matrix: Soil	
Sample Qualifier: QA / QC / RB / CS	
Sample Type: Grab / (Comp) / NA	
Sampler: Elder	
Witness:	
Contractor: DEMS	
Remarks:	

Soil Description

SM- Tan to lt brown, sand, subrounded to subangular, silty, some gravel, rounded to angular.

Taken from grid I10

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS011
Date (YYMMDD): 09-25-01
Time (HHMMSS): 11:35
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM- Tan to lt. brown, sand, subrounded to subangular, silty, some gravel, rounded to angular

Taken from Grid I11

Weather:

Prepared By: Elden P[signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS012
Date (YYMMDD): 09-25-01
Time (HHMMSS): 11:38
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM - Tan to lt brown; sand, subrounded to subangular; silty, some gravel, rounded to angular

Taken from Grid IN

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS013

Date (YYMMDD): 09-25-01
Time (HHMMSS): 12:15
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM - Tan to lt brown, sand, subrounded to subangular, silty, some gravel, rounded to sub angular.

Take from Grid I13

Weather:

Prepared By: Eldon [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS014

Date (YYMMDD): 09-25-01
Time (HHMMSS): 12:17
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM - Tan to lt brown, sand, subrounded to subangular, silty, some gravel, rounded to angular

Taken from Grid I14

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS05
Date (YYMMDD): 09-25-01
Time (HHMMSS): 12:27
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM - Tan to lt brown, sand, subrounded to subangular, silty, some gravel, rounded to angular

Taken from Grid I15

Weather:

Prepared By: Elden P[illegible]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS016

Date (YYMMDD): 09-25-01
Time (HHMMSS): 12:37
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM - Tan to lt brown, sand, subrounded to subangular, silty, some gravel, rounded to angular.

Taken from Grid I16

Weather:

Prepared By: Eldon Pe[illegible]
Checked By:

Analytical Request			
Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results	
Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS017
Date (YYMMDD): 09-25-01
Time (HHMMSS): 12:43
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM - Tan to lt brown, sand, subrounded to subangular, silty, some gravel, rounded to angular

Taken from Grid IV

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS01B + SS01BQC
Date (YYMMDD): 09-25-01
Time (HHMMSS): 12:46
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM- Tan to lt brown, sand, subrounded to subangular, silty, some gravel, rounded to angular

Taken from Grid I1B

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS019

Date (YYMMDD): 09-25-01
Time (HHMMSS): 14:00
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM - Tan to lt brown, sand, subrounded to subangular, silty, some gravel, rounded, to angular

Taken from Grid I19

This grid near MW09 pad.

Weather:

Prepared By: Elden [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D·E·M·S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS020

Date (YYMMDD): 04-25-01
Time (HHMMSS): 14:14
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM- Tan to lt brown, sand, subrounded to subangular, silty, some gravel, rounded to angular

Taken from I20

Weather:

Prepared By: Eldon [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D·E·M·S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS021

Date (YYMMDD): 09-25-01
Time (HHMMSS): 14:19
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM. Tan to lt brown, sand, subrounded to subangular, silty, some gravel rounded to angular.

Taken from grid I21

Weather:

Prepared By: Elden [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS022

Date (YYMMDD): 09-25-01
Time (HHMMSS): 14:22
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM-Tan to lt brown, sand subrounded to subangular, silty, some gravel, rounded to angular.

Taken from Grid I22

Weather:

Prepared By: Eldon [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS023
Date (YYMMDD): 09-25-01
Time (HHMMSS): 14125
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness: E
Contractor: DEMS
Remarks:

Soil Description

SM-Tan to lt brown, sand subrounded to subangular, silty, some gravel, rounded to angular

Taken from Grid I23

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS024
Date (YYMMDD): 09-26-01
Time (HHMMSS): 10:18
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elder
Witness:
Contractor: DEMS
Remarks:

Soil Description

SM- Tan, sand, subrounded to subangular, silty, some gravel rounded to angular,

Taken from Grid C1

Weather:

Prepared By: Elder [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D▪E▪M▪S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS025

Date (YYMMDD): 09-26-01
Time (HHMMSS): 10:22
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldan
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM-Tan lt brown sand, subrounded-subangular, silty, some gravel, rounded to angular

Taken from grid C-2

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS026

Date (YYMMDD): 09-26-01
Time (HHMMSS): 10:53
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM- Tan H brown sand, subrounded-subangular, silty, some gravel, rounded to angular.

Taken from grid C-3

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS027

Date (YYMMDD): 09-26-01
Time (HHMMSS): 10:56
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM-Tan & brown sand, subrounded-subangular, silty, some gravel, rounded to angular

Taken from grid C-4

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.:	2075
Site:	AMS #7
Sample ID:	AMS07SS028 QA QC
Date (YYMMDD):	04-26-01
Time (HHMMSS):	10:56
Top Depth:	0"
Bottom Depth:	6"
Matrix:	Soil
Sample Qualifier:	QA / QC / RB / CS
Sample Type:	Grab / (Comp) / NA
Sampler:	Eldon
Witness:	
Contractor:	DEMS
Remarks:	

Soil Description
SM-Tan lt brown sand, subrounded-subangular, silty, some gravel, rounded to angular.

Taken from grid C-5

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	
QA Sample			
Glass	2oz	6010B + zinc	1
Glass	4oz	7471A Mercury	1
Glass	4oz		1

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS09SS029

Date (YYMMDD): 09-26-01
Time (HHMMSS): 11:20
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM- Tan H brown sand, subrounded-subangular, silty, some gravel, rounded to angular.

Taken from grid C-6

Weather:

Prepared By: Elden [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS030
Date (YYMMDD): 09-21-01
Time (HHMMSS): 11:22
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM- Tan H brown sand, subrounded-subangular, silty, some gravel, rounded to angular

Taken from grid C-7

Weather:

Prepared By: Elden P[signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D·E·M·S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS031

Date (YYMMDD): 09-26-01
Time (HHMMSS): 11:28
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM- Tan H brown sand, subrounded-subangular, Silty, some gravel, rounded to angular.

Taken from grid C-8

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS032 QA QC

Date (YYMMDD): 09-26-01
Time (HHMMSS): 11:36
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler:
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM- Tan H brown sand, subrounded-subangular, silty, some gravel, rounded to angular

Taken from grid C-9

Weather:

Prepared By:
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
~~Glass~~		PCBs	
QA Sample			
Glass	2 oz	6010B+zinc 7471A Mercury	1
Glass	4 oz	PCB	2

PID Field Screening Results

Reading	Time
0.00	

D·E·M·S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS033

Date (YYMMDD): 04-26-01
Time (HHMMSS): 11:49
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM-Tan lt brown sand, subrounded-subangular, silty, some gravel, rounded to angular.

Taken from grid C-10

Weather:

Prepared By: Eldon [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS034
Date (YYMMDD): 09-26-01
Time (HHMMSS): 11:51
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM-Tan H brown sand, subrounded-subangular, silty, some gravel, rounded to angular

Taken from grid C-11

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.:	2075
Site:	AMS #7
Sample ID:	AMS07SS035
Date (YYMMDD):	04-26-01
Time (HHMMSS):	11:55
Top Depth:	0"
Bottom Depth:	6"
Matrix:	Soil
Sample Qualifier:	QA / QC / RB / CS
Sample Type:	Grab / (Comp) / NA
Sampler:	
Witness:	
Contractor:	DEMS
Remarks:	

Soil Description
SM-Tan lt brown, sand, subrounded-subangular, silty, some gravel, rounded to angular

Taken from grid C-12

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS36 QC QA

Date (YYMMDD): 09-26-01
Time (HHMMSS): 12:36
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elder
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM- Tan H brown sand, subrounded - subangular, silty, some gravel, rounded to angular.

Taken from grid C-13

Note: large increase in rock - angular road grad material Limestone

Weather:

Prepared By: Elder
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS037
Date (YYMMDD): 09-26-01
Time (HHMMSS): 12:15
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elda
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM-Tan & brown sand, subrounded-subangular, silty, some gravel, rounded to angular

Taken from grid C-14

Weather:

Prepared By: Elda [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS038
Date (YYMMDD): 09-26-01
Time (HHMMSS): 12:15
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elder
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM- Tan lt brown sand, subrounded-subangular, silty, some gravel, rounded to angular.

Taken from grid C-15

Weather:

Prepared By: Elder P[illegible]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS039
Date (YYMMDD): 09-26-01
Time (HHMMSS): 12:20
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM- Tan & brown sand, subrounded-subangular, silty, some gravel, rounded to angular.

Taken from grid C-16

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS040

Date (YYMMDD): 09-26-01
Time (HHMMSS): 12:25
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM-Tan lt brown sand, subrounded-subangular, silty, some gravel, rounded to angular.

Taken from grid C-17

Weather:

Prepared By: Eldon [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.:	2075
Site:	AMS #7
Sample ID:	AMS07SS041
Date (YYMMDD):	09-26-01
Time (HHMMSS):	12:28
Top Depth:	0"
Bottom Depth:	6"
Matrix:	Soil
Sample Qualifier:	QA / QC / RB / CS
Sample Type:	Grab / (Comp) / NA
Sampler:	Elden
Witness:	
Contractor:	DEMS

Remarks:

Soil Description
SM-Tan lt brown sand, subrounded-subangular, silty, some gravel, rounded to angular

Taken from grid C-18

Weather:

Prepared By: Elden [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS042

Date (YYMMDD): 09-26-01
Time (HHMMSS): 13:44
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM- Tan & brown sand, subrounded-subangular, silty, some gravel, rounded to angular.

Taken from grid C-19

note: Very high rock content - Angular road bed material limestone

Weather:

Prepared By: Eldon [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D·E·M·S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS043
Date (YYMMDD): 09-26-01
Time (HHMMSS): 13:45
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM-Tan & brown sand, subrounded-subangular, silty, some gravel, rounded to angular.

Taken from grid C-20

note: High rock content - angular road bed material limestone.

Weather:

Prepared By: Elden [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS044
Date (YYMMDD): 09-27-01
Time (HHMMSS): 8:01
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldan
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM-Tan lt brown sand, subrounded-subangular, silty, some gravel, rounded to angular.

Taken from grid C-21

note: High percent rounded rock.

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: Ams #7
Sample ID: AMS07SS045
Date (YYMMDD): 09-27-01
Time (HHMMSS): 8:06
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM- Tan lt brown sand, subrounded-subangular, silty, some gravel, rounded to angular.

Taken from grid C-22

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D▪E▪M▪S

SOIL SAMPLE COLLECTION LOG

Project No.:	2075
Site:	Ams #7
Sample ID:	AMS07SS046
Date (YYMMDD):	09-27-01
Time (HHMMSS):	8:20
Top Depth:	0"
Bottom Depth:	6"
Matrix:	Soil
Sample Qualifier:	QA / QC / RB / CS
Sample Type:	Grab / (Comp) / NA
Sampler:	Elden
Witness:	
Contractor:	DEMS
Remarks:	

Soil Description
SM - Tan H brown sand, subrounded - subangular, silty, some gravel, rounded to angular.

Taken from grid C-23

Weather:

Prepared By: Elden [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS047
Date (YYMMDD): 04-27-01
Time (HHMMSS): 8:25
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM- Tan & brown sand, subrounded-subangular, silty, some gravel, rounded to angular

Taken from grid C-24

Weather:

Prepared By: Elden [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS048

Date (YYMMDD): 09-27-01
Time (HHMMSS): 8:28
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM- Tan & brown sand, subrounded-subangular, Silty, some gravel, rounded to angular.

Taken from grid C-25

Weather:

Prepared By: Eldon P[illegible]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS049
Date (YYMMDD): 09-27-01
Time (HHMMSS): 8:32
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elder
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM- Tan lt brown sand, subrounded-subangular, Silty, some gravel, rounded to angular.

Taken from grid C-26

Weather:

Prepared By: Elder
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D■E■M■S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS050 QC QA
Date (YYMMDD): 09-26-01
Time (HHMMSS): 13:56
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldan
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM-Tan & brown sand, subrounded-subangular, silty, some gravel, rounded to angular

Taken from grid C-27

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	
QA Sample			
Glass	2oz	8RCRA + zinc	1
Glass	4oz	PCB's	2

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS051

Date (YYMMDD): 09-27-01
Time (HHMMSS): 9:02
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Ellen
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM- Tan & brown sand, subrounded-subangular, silty, some gravel, rounded to angular.

Taken from grid C-28

Note: High percent angular limestone road bed material

Weather:

Prepared By: Ellen P[illegible]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS075S052

Date (YYMMDD): 09-27-01
Time (HHMMSS): 9:08
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM-Tan lt brown sand, subrounded-subangular, silty, some gravel, rounded to angular

Taken from grid C-29

Analytical Request			
Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	

PID Field Screening Results	
Reading	Time
0.00	

Weather:

Prepared By: Elden P[illegible]
Checked By:

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS053
Date (YYMMDD): 09-27-01
Time (HHMMSS): 9:10
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM-Tan lt brown sand, subrounded-subangular, silty, some gravel, rounded to angular.

Taken from grid C-30

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS054

Date (YYMMDD): 04-27-01
Time (HHMMSS): 9:16
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM-Tan It brown sand, subrounded-subangular, silty, some gravel, rounded to angular

Taken from grid U-1

note: Increase in silt from previous site samples

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D·E·M·S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS055
Date (YYMMDD): 09-27-01
Time (HHMMSS): 9:10
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM-Tan & brown sand, subrounded-subangular, silty, some gravel, rounded to angular

Taken from grid u-2

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS056

Date (YYMMDD): 07-27-01
Time (HHMMSS):
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Ellen
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM-Tan lt brown sand, subrounded-subangular, silty, some gravel, rounded to angular

Taken from grid U-3

Weather:

Prepared By: Elden [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D▪E▪M▪S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS057
Date (YYMMDD): 09-27-01
Time (HHMMSS): 10:01
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM - Tan & brown sand, subrounded - subangular, silty, some gravel, rounded to angular

Taken from grid U-4

Weather:

Prepared By: Eldon [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS058
Date (YYMMDD): 09-27-01
Time (HHMMSS): 10:02
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM-Tan H brown sand, subrounded-subangular, silty, some gravel, rounded to angular.

Taken from grid U-5

Weather:

Prepared By: Elden [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCBs	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS0755059 QC QA
Date (YYMMDD): 09-26-01
Time (HHMMSS): 14:26
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM-Tan H brown, sand, subrounded-subangular, silty, some gravel, rounded to angular

Taken from grid U-6

Weather:

Prepared By: Eldon Pen
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	
QA	Sample		
Glass	2oz.	8RCRA + zinc	1
Glass	4oz	PCB's	2

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS060
Date (YYMMDD): 09-27-01
Time (HHMMSS): 10:09
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Elder
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM-Tan lt brown, sand, subrounded-subangular, silty, some gravel, rounded to angular.

Taken from grid U-7

Weather:

Prepared By: Elder [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS061
Date (YYMMDD): 04-27-01
Time (HHMMSS): 10:10
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: Grab / (Comp) / NA
Sampler: Ellen
Witness:
Contractor: DEMS
Remarks:

Soil Description
SM - Tan lt brown sand, subrounded - subangular, silty, some gravel, rounded to angular

Taken from grid U-8

Weather:

Prepared By: Ellen [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS062
Date (YYMMDD): 04-27-01
Time (HHMMSS): 10:57
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: ~~Grab~~ (Comp) ~~/NA~~ Grab
Sampler: Elder
Witness:
Contractor: DEMS
Remarks:

Soil Description

SP - Tan, sand, subrounded to sub angular, trace silt, wind blown deposits

Weather:

Prepared By: Elder P[illegible]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A, Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D·E·M·S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7

Sample ID: AMS07SS063

Date (YYMMDD): 09-27-01
Time (HHMMSS): 10:50
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: ~~Grab / Comp / NA~~ Grab
Sampler:
Witness:
Contractor: DEMS
Remarks:

Soil Description

SP - Tan, sand, subrounded subangular, trace silt, wind ~~blown~~ blown deposit

Background sample

Weather:

Prepared By: [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS064
Date (YYMMDD): 04-27-01
Time (HHMMSS): 10:40
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: ~~Grab / Comp / NA~~ grab
Sampler: Eldon
Witness:
Contractor: DEMS
Remarks:

Soil Description

SP- Tan, sand, subrounded to sub-angular, trace silt, ~~wind blown deposit~~ wind blown deposit

Background sample

Weather:

Prepared By: Eldon [signature]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

D•E•M•S

SOIL SAMPLE COLLECTION LOG

Project No.: 2075
Site: AMS #7
Sample ID: AMS07SS065
Date (YYMMDD): 09-27-01
Time (HHMMSS): 10:37
Top Depth: 0"
Bottom Depth: 6"
Matrix: Soil
Sample Qualifier: QA / QC / RB / CS
Sample Type: ~~Grab / (Comp) / NA~~ Grab
Sampler: Elden
Witness:
Contractor: DEMS
Remarks:

Soil Description

SP - Tan, sand, subrounded to sub-angular, trace silt, Wind ~~thrown~~ blown deposits

Weather:

Prepared By: Elden P[illegible]
Checked By:

Analytical Request

Container Type	Sample Volume	Parameter	Number of Containers
Glass	2 oz	6010B + zinc	1
		7471A Mercury	
		PCB's	

PID Field Screening Results

Reading	Time
0.00	

Appendix C

Monitoring Well

Development Logs

rMS #7

D•E•M•S

MONITORING WELL DEVELPOMENT/PURGING LOG

WELL NO.: MW 06

DATE: 09-04-01 – 09-05-01

Depth from Top of Casing:

Top of water (ft) 25.05 - 2.53 = 22.54 bgs
Bottom of well (ft) 33.83 - 2.53 = 31.30 bgs
Well diameter (in) 2

Top, sampling interval: —
Bottom, sampling interval —
V= 0.0408 x ΔH (ft) x D (in²) 1.43 (gal)
3 x V= 24.24 (gal)
Well volume in Filter pack 6.65
Total well volume 6.65-1.43 = 8.08 gallons

Well Development Technique:

Pumping with 12 volt electic pump
Did not surge - well volume very low - top of water below top of screen

Groundwater Parameters

TIME	VOLUME (Gal)	TURBIDITY (± 10.0%)	S.C. (± 3.0%)	D.O. (± 10.0%)	TEMP. (± 0.5°C)	pH (± 0.1%)
	+9 gal from 09-04-01					
10:17	11.5	71.4	396	}	21.7	7.02
10:22	18	47.0	400		21.1	6.94
10:27	20.5	4.72	401		20.8	6.96
10:36	27	6.24	401		21.1	7.04
10:42	29	1.57	405		20.7	7.03
10:47	31.5	1.19	401		20.9	7.07
10:51	34	1.60	403		20.9	7.08
10:55	36	1.15	404		20.8	7.08

NOTES:

When First opened well was not under pressure or vacuum. PID reading 0.00 PPM. 09-04-01 Recovered 9 gallons - well did not pump dry. First Flow very cloudy - Clearing at end of pumping. Top of water on 09-05-01 25.11 (From top of casing). Well did not pump dry.

Development/Purging Oversight: Eldon Penn

[signature]

Page 1 of 1

AMS #7

D•E•M•S

MONITORING WELL DEVELPOMENT/PURGING LOG

WELL NO.: MW 07

DATE: 09-04-01 — 09-05-01

Depth from Top of Casing:

Top of water (ft) 16.65 - 2.67 = 13.98 bgs

Bottom of well (ft) 26.22 - 2.67 = 23.55 bgs

Well diameter (in) 2

Top, sampling interval: ——

Bottom, sampling interval ——

V= 0.0408 x ΔH (ft) x D (in^2) 1.56 (gal)

3 x V= 26.49 (gal)

Volume in Filter pack 7.28 gallons

Total well volume 7.28 + 1.56 = 8.83 gallons

Well Development Technique:

Pumping with 12 volt electric pump.
Did not surge - well volume very low - top of water below top of screen.

Groundwater Parameters

TIME	VOLUME (Gal)	TURBIDITY (± 10.0%)	S.C. (± 3.0%)	D.O. (± 10.0%)	TEMP. (± 0.5°C)	pH (± 0.1%)
	+9 gal from 09-04-01					
11:24	10	10.02	713		23.1	6.67
11:33	12	82.5	709		23.6	6.87
11:42	13.5	47.5	704		23.3	6.87
11:55	14	27.5	703		23.2	6.83
12:06	14.5	21.6	690		24.9	6.79
12:10	14.75	14.2	699		25	6.78
12:16	15	11.3	700		24.8	6.84

NOTES:

When first opened well not under pressure or vacuum. PID reading 0.00 PPM. 09-04-01 Pumped dry at 2.5 gallons. Slow recharge. Contined until 9 gallons removed. First fluid very cloudy - clearing at the end of pumping. Top of water on 09-05-01 - 16.69'. Turbidity erratic probably due to pumping well dry between each parameter check.

Development/Purging Oversight: Eldon Penn

[signature]

Page 1 of 1

AMS #7

D▪E▪M▪S

MONITORING WELL DEVELPOMENT/PURGING LOG

WELL NO.: MW 08

DATE: 09-04-01 09-05-01

Depth from Top of Casing:

Top of water (ft) 24.48 - 3.03 = 21.45 bgs

Bottom of well (ft) 28.03 - 3.03 = 25 bgs

Well diameter (in) 2

Top, sampling interval:

Bottom, sampling interval

V= 0.0408 x ΔH (ft) x D (in^2) .58 (gal)

3 x V= 9.81 (gal)

Volume in Filter pack = 2.78 gallons

Total well volume 2.78 + .58 = 3.27 gallons

Well Development Technique:

Pumping with 12 volt electic pump.
Did not surge - well volume very low - top of water below top of screen

Groundwater Parameters

	TIME	VOLUME (Gal)	TURBIDITY (± 10.0%)	S.C. (± 3.0%)	D.O. (± 10.0%)	TEMP. (± 0.5°C)	pH (± 0.1%)
09-04-01	14:38	1	off scale	686		25.8	6.68
	14:55	2.5	3.7	686		23.2	6.91
	15:00	4.5	9	641		25	6.65
	15:45	8	~	~		~	~
09-05-01	13:30	8.5	10.15	620		22.5	6.77
	13:36	9	21.00	616		22.3	6.78
	13:43	9.5	12.70	625		21.6	6.79
	13:51	10	7.95	629		21.3	6.76

NOTES:

When First opened well not under pressure or vacuum. PID reading 0.00 PPM. 09-04-01 - Well pumped dry at .75 gallons - slow recharge. Took parameter readings to 4.5 gallons removed. PH meter stopped working. Continued removing water until 8 total gallons removed.
09-05-01 - Top of water 24.49' (From top of casing)

Development/Purging Oversight: Eldon Penn

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Eldon P[illegible]

AMS #7

D•E•M•S

MONITORING WELL DEVELPOMENT/PURGING LOG

WELL NO.: MW 08

DATE: 09-04-01 – 09-05-01

Depth from Top of Casing:

Top of water (ft) 24.48 - 3.03 = 21.45 bgs
Bottom of well (ft) 28.03 - 3.03 = 25 bgs
Well diameter (in) 2

Top, sampling interval: ——
Bottom, sampling interval ——
V= 0.0408 x ΔH (ft) x D (in²) .58 (gal)
3 x V= 9.81 (gal)
Volume in Filter pack = 2.78 gal
Total well volume 2.78 + .58 = 3.27 gal

Well Development Technique:

Pumping with 12 volt electic pump
Did not surge - well volume very low - top of water below top of screen

Groundwater Parameters

TIME	VOLUME (Gal)	TURBIDITY (± 10.0%)	S.C. (± 3.0%)	D.O. (± 10.0%)	TEMP. (± 0.5°C)	pH (± 0.1%)
13:55	10.5	6.28	631		21.5	6.73
14:03	11	5.52	628		21.1	6.76
14:13	12	4.68	629		20.6	6.73
14:18	12.5	5.75	632		20.7	6.79

NOTES:

09-05-01 - Well pumped dry between each parameter reading. Stopped development - recharge slowing down. Parameter had stabilized.

Development/Purging Oversight: Eldon Penn

Page 2 of 2

AMJ #7

D▪E▪M▪S

MONITORING WELL DEVELPOMENT/PURGING LOG

WELL NO.: MW 09

DATE: 09-05-01 09-06-01

Depth from Top of Casing:

Top of water (ft) 25.47 - 3.40 = 22.07
Bottom of well (ft) 215.42
Well diameter (in) 4

Top, sampling interval: ———
Bottom, sampling interval ———
V= 0.0408 x ΔH (ft) x D (in²) 124 (gal)
3 x V= 390 (gal)

Volume in Filter pack 6.12 gal
Total well volume 6.12 + 124 = 130.12

Well Development Technique:

Three quarter horse power 220 volt electic pump.
Did not sand bail well. - due to no apparent Fill and past low recharge rate.

Groundwater Parameters

	TIME	VOLUME (Gal)	TURBIDITY (± 10.0%)	S.C. (± 3.0%)	D.O. (± 10.0%)	TEMP. (± 0.5°C)	pH (± 0.1%)
09-05-01	16:20	30	243	7.19		20.8	9.68
	16:25	100	495	7.12		20.9	10.76
	16:39	135	252	7.07		24.7	10.85
	17:07	142	1021	6.97		23.5	10.79
09-06-01	7:43	162	57.8	8.16		19.7	7.23
	7:50	182	16.70	8.13		19.6	7.12
	7:53	202	7.59	8.07		19.6	7.05
	7:59	Well pump dry					

NOTES:

When First opened well not under pressure or vacuum. PID reading 0.00 PPM. 09-05-01 - Well pumped dry at 130 gal. Slow recharge rate Let well recharge over night. 09-06-01 - Top of water 109.11' (From top of casing). Poor over night recharge. Well pumped dry after 70 gallons. No recharge after 30 min.

Development/Purging Oversight: Eldon Penn

[signature]

Page __ of __

Appendix D

Calibration Logs

D▪E▪M▪S

INSTRUMENT CALBRATION LOG

DEMS PROJECT NO. 2075 AMS # 7

DATE	TIME	INSTRUMENT TYPE/NO.	CALBRATION MEDIA/STANDARD	INITIAL READING	FINAL READING	PASS – P FAIL - F
09/04/01	10:02	LaMotte 2020 Turbidimeter	Turbidity Standard 10 NTU	10.01	10.01	P
09/04/01	10:07	Corning (Conductivity) Checkmate II	1408 Conductivity Standard	1397	1400	P
09/04/01	10:16	Corning Checkmate II pH	pH Buffer 7	6.93	6.99	P
09/04/01	10:22	Corning Checkmate II pH	pH Buffer 10	9.93	9.99	P

PHOTOIONIZATION DETECTOR
CALIBRATION DATA SHEET

:T # 2075

STRUMENT NO. 580B OVM

CALIBRATION GAS: Isobutylene

AMP TYPE: ___________

DATE	TIME	PERSON CALIBRATING	SPAN SETTING	READING (PPM) 100 PPM Span Gas	REMARKS
09/04/01	9:54	Eldon Penn	100 PPM	99.7 101.7 101.3	Passed

D▪E▪M▪S

INSTRUMENT CALIBRATION LOG

Ams # 7

DEMS PROJECT NO. 2015

DATE	TIME	INSTRUMENT TYPE/NO.	CALIBRATION MEDIA/STANDARD	INITIAL READING	FINAL READING	PASS – P FAIL - F
09-05-01	8:38	PH meter	4.0 Buffer 7.0 Buffer	3.97 7.27	4.00 7.01	Pass Pass
09-05-01	9:16	LaMotte 2020 Turbimeter	10 Standard 1 Standard	10.07 1.12	10:00 ntu 1.05 ntu	Pass Pass
09-05-01	9:18	Corning Checkmate II conductivity	0 Air 1408 Standard	0 1407	0 1409	Pass Pass

PHOTOIONIZATION DETECTOR
CALIBRATION DATA SHEET

JCT # 2075

INSTRUMENT NO. 580B OVM

LAMP TYPE: ______

CALIBRATION GAS: Isobutylene

DATE	TIME	PERSON CALIBRATING	SPAN SETTING	READING (PPM) 100 PPM – Span Gas	REMARKS
09-05-01	8:10	Eldon	100 ppm	96.7 99.7 99.0	Passed

D·E·M·S

INSTRUMENT CALIBRATION LOG

DEMS PROJECT NO. 2075 AMS #7

DATE	TIME	INSTRUMENT TYPE/NO.	CALIBRATION MEDIA/STANDARD	INITIAL READING	FINAL READING	PASS – P FAIL - F
09-06-01	7:04	PH meter	7.0 Buffer 10.0 Buffer	7.06 9.99	7.02 9.99	P P
09-06-01	7:08	La Motte 2020 Turbidimeter	10 Standard 1 Standard	10.24 1.01	10.01 1.01	P P
09-06-01	7:10	Corning Checkmate II Conductivity	0 Air 1408 Standard	0 1414	– –	P P

D•E•M•S

INSTRUMENT CALIBRATION LOG

DEMS PROJECT NO. 2075 AMS# 7

Flowcell # MP20-1011 Turbidity meter # 2020

DATE	TIME	INSTRUMENT TYPE/NO.	CALIBRATION MEDIA/STANDARD	INITIAL READING	FINAL READING	PASS – P FAIL - F
9-~~24~~-01 25	0905	Flow cell	Specific conductivity	10.0	10.0	P
	0907	Flow cell	pH - 7	7.14	7.0	P
	0908	Flow cell	pH - 4	4.14	4.0	P
	0910	Flowcell	BP	760	760	P
	0912	Flowcell	% DO	100 %	100%	P
	0835	Turbidity	10.0	10.23	10.0	P
	0840	Turbidity	1.0	1.05	1.0	P
	1500	Flow cell	SP	10.4	10.0	P
	1503	Flowcell	pH-7	7.1	7.0	P
	1507	Flowcell	pH-4	4.13	4.0	P
	1509	Flow cell	BP	760	760	P
	1511	Flowcell	% DO	100%	100%	P
	1520	Turbidity	10.0	10.23	10.0	P
	1522	Turbidity	1.0	1.05	1.0	P

PHOTOIONIZATION DETECTOR
CALIBRATION DATA SHEET

CT # 2075

NSTRUMENT NO. ____________

AMP TYPE: ____________

CALIBRATION GAS: Isobutylene

DATE	TIME	PERSON CALIBRATING	SPAN SETTING	READING (PPM)	REMARKS
9-25-01	1540	S Harris	100	100 ppm	Pass

D·E·M·S

INSTRUMENT CALIBRATION LOG

DEMS PROJECT NO. 2075 AMS 7

Flow cell # MP 20-1011 Turbidity # 2020

DATE	TIME	INSTRUMENT TYPE/NO.	CALIBRATION MEDIA/STANDARD	INITIAL READING	FINAL READING	PASS – P FAIL - F
9-26-01	0750	Flowcell	SP	10.14	10.0	P
9-26-01	0751	Flow cell	pH - 7	7.16	7.0	P
9-26-01	0753	Flow cell	pH - 4	4.01	4.0	P
9-26-01	0755	Flowcell	BP	760	760	P
9-26-01	0757	Flow cell	% DO	100	100%	P
9-26-01	0746	Turbidity	10.0	10.16	10.0	P
9-26-01	0748	Turbidity	1.0	1.05	1.0	P
9-26-01	1400	Flowcell	SP	10.16	10.0	P
9-26-01	1402	↓	pH - 7	7.01	7.0	P
9-26-01	1404		pH - 4	4.10	4.0	P
9-26-01	1406		BP	760	760	P
9-26-01	1408		% DO	100%	100%	P
9-26-01	1412	Turbidity	10.0	10.09	10.0	P
9-26-01	1413	↓	1.0	1.01	1.0	P

Appendix F

Transportation
And
Disposal
Documentation

Waste Manifest

№ 22224

January Environmental Services, Inc.

2701 South Prospect
Oklahoma City, OK 73129
(405) 670-2030
FAX: (405) 670-6747

Invoice No. 52607

GENERATOR INFORMATION

Business Name: U.S.A.C.E. - Tulsa District (Missile site #7)

Address: 1645 S. 101 E. Ave Tulsa OK 74128

Telephone: 918 669-7519 Billing to: Deeringwater Environmental

Waste Description: Purge water from monitoring well

Waste Volume: 200 gallon Cost $

Date Removed: 12-3-01

Generator: x Eldon Penn for USACE (PRINT) x [signature] (SIGN)

TRANSPORTATION INFORMATION

Business Name: January Transport, Inc.

Address: 2701 South Prospect Oklahoma City, OK

Telephone: (405) 670-2030

Waste Volume: 200 gallon

Driver's name: Louis Martinez (PRINT) [signature] (SIGN)

DISPOSAL INFORMATION

Business Name: January Environmental Services, Inc.

Address: 2701 South Prospect Oklahoma City, OK

Telephone: (405) 670-2030

Date 12-3-01

Operator Name: LARRY SMATHERS (PRINT) [signature] (SIGN)

WHITE—DISPOSAL YELLOW—TRANSPORTER PINK—RETURN COPY GOLDENROD—GENERATOR

Appendix G

Risk Reduction Rules
Standard 2 Tables

Updated Examples of Standard No. 2, Appendix II Medium-Specific Concentrations (MSCs)

Background Information:

Section 335.558(d) of the existing Risk Reduction Rules indicates that the Commission will periodically revise the example unadjusted Standard No. 2 MSCs presented in the Appendix II table to reflect newly promulgated standards and to provide MSCs based on current toxicological data. Additionally, §335.556(b) requires consideration of other exposure pathways by which human populations are likely to be exposed (e.g., dermal absorption and vegetable uptake) when setting MSCs.

However, because no specific equations or parameters were provided in the rule, consideration of the dermal absorption pathway has not been addressed in a consistent manner. Therefore, in order to facilitate implementation of Standard No. 2, the MSC values have been updated to reflect current standards (e.g., MCLs), toxicological factors, the soil dermal absorption exposure pathway where appropriate (see Section VII of the memo entitled Implementation of the Existing Risk Reduction Rule for more detail), and to identify contaminants where exposure through vegetable consumption is of particular concern (i.e., cadmium). The updated Standard No. 2 MSCs are provided below for your convenience.

The updated Standard No. 2 Soil MSCs have been calculated using the Risk Reduction Standard No. 2 equations, with the addition of the dermal pathway, updated toxicity factors, and updated chemical/physical properties. In calculating the updated Standard No. 2 Soil MSCs, a risk level of 10^{-6} was used for Class A and B carcingens and a risk level of 10^{-5} was used for Class C carcinogens, and a hazard quotient of 1 was used for all noncarcinogens. In cases where contaminants had both carcinogenic and noncarcinogenic toxicity factors, both types of MSCs (carcinogenic and noncarcinogenic) were calculated and the lowest value (i.e., most conservative) was selected as the updated Standard No. 2 Soil MSC.

The updated Standard No. 2 Groundwater MSCs have been calculated using the MCL (when available) or Risk Reduction Standard No. 2 equations with updated toxicity factors when MCLs were not available. In calculating the updated Standard No. 2 Groundwater MSCs, a risk level of 10^{-6} was used for Class A and B carcingens and a risk level of 10^{-5} was used for Class C carcinogens, and a hazard quotient of 1 was used for all noncarcinogens. In cases where contaminants had both carcinogenic and noncarcinogenic toxicity factors, both types of MSCs (carcinogenic and noncarcinogenic) were calculated and the lowest value (i.e., most conservative) was selected as the updated Standard No. 2 Groundwater MSC.

Abbreviations:

CAS# - Chemical Abstracts Service number
GW-Res - Groundwater MSC for Residential Use
GW-Ind - Groundwater MSC for Industrial Use
GWP-Res - Soil MSC for Residential Use Based on Groundwater Protection
GWP-Ind - Soil MSC for Industrial Use Based on Groundwater Protection
SAI-Res - Soil MSC for Residential Use Based on Inhalation, Ingestion, and Dermal Contact
SAI-Ind - Soil MSC for Industrial Use Based on Inhalation, Ingestion, and Dermal Contact

Updated Examples of Standard No. 2, Appendix II Medium-Specific Concentrations (MSCs)

(Last update: March 15, 2001)

Contaminant	CAS #	GW-Res (mg/l)	GW-Ind (mg/l)	GWP-Res (mg/kg)	GWP-Ind (mg/kg)	SAI-Res[a] (mg/kg)	SAI-Ind[a] (mg/kg)
Acenaphthene	83-32-9	2.2E+00	6.1E+00	2.2E+02	6.1E+02	8.2E+03	5.3E+04
Acenaphthylene	208-96-8	2.2E+00	6.1E+00	2.2E+02	6.1E+02	8.2E+03	5.3E+04
Acetaldehyde	75-07-0	3.7E+00	1.0E+01	3.7E+02	1.0E+03	5.2E+00	8.8E+00
Acetone	67-64-1	3.7E+00	1.0E+01	3.7E+02	1.0E+03	1.6E+03	2.4E+03
Acetone cyanohydrin	75-86-5	2.9E-02	8.2E-02	2.9E+00	8.2E+00	1.2E+02	8.2E+02
Acetonitrile	75-05-8	---	---	---	---	1.8E+02	2.6E+02
Acetophenone	98-86-2	3.7E+00	1.0E+01	3.7E+02	1.0E+03	2.7E+03	4.3E+03
Acifluorfen, sodium	62476-59-9	4.7E-01	1.3E+00	4.7E+01	1.3E+02	2.0E+03	1.3E+04
Acrolein	107-02-8	7.3E-01	2.0E+00	7.3E+01	2.0E+02	5.5E+03	4.1E+04
Acrylamide	79-06-1	1.9E-05	6.4E-05	1.9E-03	6.4E-03	1.1E-01	6.4E-01
Acrylic acid	79-10-7	1.8E+01	5.1E+01	1.8E+03	5.1E+03	1.4E+05	1.0E+06
Acrylonitrile	107-13-1	1.6E-04	5.3E-04	1.6E-02	5.3E-02	7.9E-02	1.4E-01
Alachlor	15972-60-8	2.0E-03	2.0E-03	2.0E-01	2.0E-01	6.1E+00	3.6E+01
Aldicarb	116-06-3	7.0E-03	7.0E-03	7.0E-01	7.0E-01	1.5E+02	1.0E+03
Aldicarb sulfone	1646-88-4	7.0E-03	7.0E-03	7.0E-01	7.0E-01	1.5E+02	1.0E+03
Aldrin	309-00-2	5.0E-06	1.7E-05	5.0E-04	1.7E-03	2.7E-02	1.4E-01

Updated Examples of Standard No. 2, Appendix II Medium-Specific Concentrations (MSCs)

(Last update: March 15, 2001)

Contaminant	CAS #	GW-Res (mg/l)	GW-Ind (mg/l)	GWP-Res (mg/kg)	GWP-Ind (mg/kg)	SAI-Res[a] (mg/kg)	SAI-Ind[a] (mg/kg)
Allyl alcohol	107-18-6	1.8E-01	5.1E-01	1.8E+01	5.1E+01	1.4E+03	1.0E+04
Allyl chloride	107-05-1	3.7E-01	1.0E+00	3.7E+01	1.0E+02	1.3E+00	1.8E+00
Aluminum	7429-90-5	3.7E+01	1.0E+02	3.7E+03	1.0E+04	1.5E+05	1.0E+06
Aminopyridine, 4-	504-24-5	7.3E-04	2.0E-03	7.3E-02	2.0E-01	3.1E+00	2.0E+01
Amino-2,6-dinitrotoluene, 4-	19406-51-0	6.1E-03	1.7E-02	6.1E-01	1.7E+00	2.6E+01	1.7E+02
Amino-4,6-dinitrotoluene, 2-	35572-78-2	6.1E-03	1.7E-02	6.1E-01	1.7E+00	2.6E+01	1.7E+02
Ammonia	7664-41-7	---	---	---	---	1.6E+02	2.3E+02
Aniline	62-53-3	1.5E-02	5.0E-02	1.5E+00	5.0E+00	8.6E+01	5.0E+02
Anthracene	120-12-7	1.1E+01	3.1E+01	1.1E+03	3.1E+03	4.1E+04	2.7E+05
Antimony	7440-36-0	6.0E-03	6.0E-03	6.0E-01	6.0E-01	7.2E+01	4.9E+02
Aramite	140-57-8	3.4E-03	1.1E-02	3.4E-01	1.1E+00	2.0E+01	1.1E+02
Arsenic	7440-38-2	5.0E-02	5.0E-02	5.0E+00	5.0E+00	2.0E+01[b]	2.0E+02[b]
Arsine	7784-42-1	---	---	---	---	---	---
Asbestos	1332-21-4	---	---	---	---	---	---
Atrazine	1912-24-9	3.0E-03	3.0E-03	3.0E-01	3.0E-01	2.2E+01	1.3E+02
Barium	7440-39-3	2.0E+00	2.0E+00	2.0E+02	2.0E+02	9.1E+03	5.9E+04
Benzaldehyde	100-52-7	3.7E+00	1.0E+01	3.7E+02	1.0E+03	1.8E-01	2.5E-01
Benzene	71-43-2	5.0E-03	5.0E-03	5.0E-01	5.0E-01	8.8E-01	1.6E+00
Benzenethiol	108-98-5	3.7E-04	1.0E-03	3.7E-02	1.0E-01	1.5E+00	3.9E+00
Benzidine	92-87-5	3.7E-07	1.2E-06	3.7E-05	1.2E-04	2.1E-03	1.2E-02
Benz-a-anthracene	56-55-3	2.0E-04	3.9E-04	2.0E-02	3.9E-02	6.3E-01	3.4E+00
Benzo-a-pyrene	50-32-8	2.0E-04	2.0E-04	2.0E-02	2.0E-02	6.3E-02	3.4E-01
Benzo-b-fluoranthene	205-99-2	2.0E-04	3.9E-04	2.0E-02	3.9E-02	6.3E-01	3.4E+00
Benzo-k-fluoranthene	207-08-9	1.2E-03	3.9E-03	1.2E-01	3.9E-01	6.3E+00	3.4E+01
Benzo-g,h,i-perylene	191-24-2	1.1E+00	3.1E+00	1.1E+02	3.1E+02	4.1E+03	2.7E+04
Benzoic acid	65-85-0	1.5E+02	4.1E+02	1.5E+04	4.1E+04	6.2E+05	4.1E+06
Benzotrichloride	98-07-7	6.6E-06	2.2E-05	6.6E-04	2.2E-03	3.8E-02	2.2E-01
Benzyl alcohol	100-51-6	1.1E+01	3.1E+01	1.1E+03	3.1E+03	4.6E+04	3.1E+05
Benzyl chloride	100-44-7	5.0E-04	1.7E-03	5.0E-02	1.7E-01	3.8E+00	3.4E+01
Beryllium	7440-41-7	4.0E-03	4.0E-03	4.0E-01	4.0E-01	4.6E+01	2.7E+02
Biphenyl, 1,1-	92-52-4	1.8E+00	5.1E+00	1.8E+02	5.1E+02	1.9E+02	2.7E+02
Bis (2-chloroethoxy) methane	111-91-1	3.9E-07	1.3E-06	3.9E-05	1.3E-04	2.2E-03	1.3E-02
Bis (2-chloroethyl) ether	111-44-4	7.7E-05	2.6E-04	7.7E-03	2.6E-02	1.5E-01	3.2E-01
Bis (2-chloroisopropyl) ether	108-60-1	1.2E-02	4.1E-02	1.2E+00	4.1E+00	4.8E+01	1.5E+02
Bis (2-chloromethyl) ether	542-88-1	3.9E-07	1.3E-06	3.9E-05	1.3E-04	1.1E-04	1.9E-04
Bis (2-ethyl-hexyl) phthalate	117-81-7	6.0E-03	6.0E-03	6.0E-01	6.0E-01	1.7E+01	6.5E+01
Bisphenol A	80-05-7	1.8E+00	5.1E+00	1.8E+02	5.1E+02	7.7E+03	5.1E+04
Boron	7440-42-8	3.3E+00	9.2E+00	3.3E+02	9.2E+02	2.3E+04	1.7E+05
Bromobenzene	108-86-1	7.3E-01	2.0E+00	7.3E+01	2.0E+02	8.0E+00	1.1E+01
Bromodichloromethane	75-27-4	1.0E-01	1.0E-01	1.0E+01	1.0E+01	1.0E+01	9.2E+01
Bromoform	75-25-2	1.0E-01	1.0E-01	1.0E+01	1.0E+01	3.4E+01	8.5E+01
Bromomethane	74-83-9	5.1E-02	1.4E-01	5.1E+00	1.4E+01	3.5E+00	4.9E+00
Bromophenyl phenylether, 4-	101-55-3	5.7E-05	1.9E-04	5.7E-03	1.9E-02	3.1E-01	1.6E+00
Butadiene, 1,3-	106-99-0	---	---	---	---	1.8E-02	3.0E-02
Butanol, n-	71-36-3	3.7E+00	1.0E+01	3.7E+02	1.0E+03	2.7E+04	2.0E+05
Butyl acrylate	141-32-2	3.3E-01	9.2E-01	3.3E+01	9.2E+01	8.6E+01	1.2E+02
Butylbenzene, n-	104-51-8	1.5E+00	4.1E+00	1.5E+02	4.1E+02	2.7E+03	5.7E+03
Butylbenzene, sec-	135-98-8	1.5E+00	4.1E+00	1.5E+02	4.1E+02	3.0E+03	5.4E+03
Butylbenzene, tert-	98-06-6	1.5E+00	4.1E+00	1.5E+02	4.1E+02	2.6E+03	4.5E+03
Butylate	2008-41-5	1.8E+00	5.1E+00	1.8E+02	5.1E+02	7.7E+03	5.1E+04
Butyl benzyl phthalate	85-68-7	7.3E+00	2.0E+01	7.3E+02	2.0E+03	3.1E+04	2.0E+05

Updated Examples of Standard No. 2, Appendix II Medium-Specific Concentrations (MSCs)

(Last update: March 15, 2001)

Contaminant	CAS #	GW-Res (mg/l)	GW-Ind (mg/l)	GWP-Res (mg/kg)	GWP-Ind (mg/kg)	SAI-Res[a] (mg/kg)	SAI-Ind[a] (mg/kg)
Cacodylic acid	75-60-5	1.1E-01	3.1E-01	1.1E+01	3.1E+01	4.6E+02	3.1E+03
Cadmium	7440-43-9	5.0E-03	5.0E-03	5.0E-01	5.0E-01	2.4E+02[c]	1.5E+03
Caprolactam	105-60-2	1.8E+01	5.1E+01	1.8E+03	5.1E+03	7.7E+04	5.1E+05
Captan	133-06-2	2.4E-02	8.2E-02	2.4E+00	8.2E+00	1.4E+02	8.2E+02
Carbaryl	63-25-2	3.7E+00	1.0E+01	3.7E+02	1.0E+03	1.5E+04	1.0E+05
Carbazole	86-74-8	4.3E-03	1.4E-02	4.3E-01	1.4E+00	2.4E+01	1.4E+02
Carbofuran	1563-66-2	4.0E-02	4.0E-02	4.0E+00	4.0E+00	7.7E+02	5.1E+03
Carbon disulfide	75-15-0	3.7E+00	1.0E+01	3.7E+02	1.0E+03	1.0E+03	1.5E+03
Carbon tetrachloride	56-23-5	5.0E-03	5.0E-03	5.0E-01	5.0E-01	3.5E-01	6.3E-01
Carbosulfan	55285-14-8	3.7E-01	1.0E+00	3.7E+01	1.0E+02	1.5E+03	1.0E+04
Chloral	75-87-6	3.7E+00	1.0E+01	3.7E+02	1.0E+03	2.7E+04	2.0E+05
Chloral hydrate (1,1-ethanediol, 2,2,2-trichloro-)	302-17-0	3.7E+00	1.0E+01	3.7E+02	1.0E+03	1.5E+04	1.0E+05
Chlordane (technical)	12789-03-6	2.0E-03	2.0E-03	2.0E-01	2.0E-01	1.6E+00	1.1E+01
Chlordane, cis- (alpha chlordane)	5103-71-9	2.4E-04	8.2E-04	2.4E-02	8.2E-02	1.4E+00	8.0E+00
Chlordane, gamma	57-74-9	2.4E-04	8.2E-04	2.4E-02	8.2E-02	1.8E+00	1.6E+01
Chlorfenvinphos	470-90-6	2.6E-02	7.2E-02	2.6E+00	7.2E+00	1.1E+02	7.2E+02
Chlorine	7782-50-5	4.0E+00	4.0E+00	4.0E+02	4.0E+02	2.0E+04	1.4E+05
Chloroaniline, p-	106-47-8	1.5E-01	4.1E-01	1.5E+01	4.1E+01	6.2E+02	4.1E+03
Chlorobenzene	108-90-7	1.0E-01	1.0E-01	1.0E+01	1.0E+01	4.0E+02	5.9E+02
Chlorobenzilate	510-15-6	3.2E-04	1.1E-03	3.2E-02	1.1E-01	1.8E+00	1.1E+01
Chlorobromomethane (bromochloromethane)	74-97-5	1.5E+00	4.1E+00	1.5E+02	4.1E+02	2.4E+02	3.4E+02
Chloro-1,3-butadiene, 2-	126-99-8	---	---	---	---	1.0E+01	1.4E+01
Chlorodifluoromethane	75-45-6	---	---	---	---	1.1E+04	1.5E+04
Chloroethane (ethyl chloride)	75-00-3	1.5E+01	4.1E+01	1.5E+03	4.1E+03	1.1E+04	1.7E+04
Chloroethoxy ethene, 2- (2-chloroethylvinylether)	110-75-8	7.7E-04	2.6E-03	7.7E-02	2.6E-01	2.1E+00	3.0E+00
Chloroform	67-66-3	1.0E-01	1.0E-01	1.0E+01	1.0E+01	3.1E-01	5.1E-01
Chloromethane	74-87-3	6.6E-02	2.2E-01	6.6E+00	2.2E+01	2.3E+00	3.8E+00
Chloro-3-methylphenol, 4-	59-50-7	1.8E-01	5.1E-01	1.8E+01	5.1E+01	7.7E+02	5.1E+03
Chloronaphthalene, 2- (chloronaphthalene, beta)	91-58-7	2.9E+00	8.2E+00	2.9E+02	8.2E+02	1.1E+04	7.1E+04
Chlorophenol, 2-	95-57-8	1.8E-01	5.1E-01	1.8E+01	5.1E+01	1.1E+03	4.0E+03
Chlorophenyl phenylether, 4-	7005-72-3	5.7E-05	1.9E-04	5.7E-03	1.9E-02	2.8E-01	1.2E+00
Chlorotoluene, o- (2-chlorotoluene)	95-49-8	7.3E-01	2.0E+00	7.3E+01	2.0E+02	1.5E+03	3.5E+03
Chlorotoluene, p- (4-chlorotoluene)	106-43-4	7.3E-01	2.0E+00	7.3E+01	2.0E+02	3.4E+00	4.8E+00
Chlorpyrifos	2921-88-2	1.1E-01	3.1E-01	1.1E+01	3.1E+01	4.6E+02	3.1E+03
Chromium (III) (total chromium)	16065-83-1/ 7440-47-3	1.0E-01	1.0E-01	1.0E+01	1.0E+01	5.9E+04	3.5E+05
Chromium (VI)	18540-29-9	1.0E-01	1.0E-01	1.0E+01	1.0E+01	2.0E+02	1.2E+03
Chrysene	218-01-9	1.2E-02	3.9E-02	1.2E+00	3.9E+00	6.3E+01	3.4E+02
Cobalt	7440-48-4	2.2E+00	6.1E+00	2.2E+02	6.1E+02	1.5E+04	1.1E+05
Copper	7440-50-8	1.3E+00	1.3E+00	1.3E+02	1.3E+02	1.0E+04	7.4E+04
Coumaphos	56-72-4	2.6E-01	7.2E-01	2.6E+01	7.2E+01	1.1E+03	7.2E+03
Cresol, m- (3-methylphenol)	108-39-4	1.8E+00	5.1E+00	1.8E+02	5.1E+02	7.7E+03	5.1E+04
Cresol, o- (2-methylphenol)	95-48-7	1.8E+00	5.1E+00	1.8E+02	5.1E+02	7.7E+03	5.1E+04
Cresol, p- (4-methylphenol)	106-44-5	1.8E-01	5.1E-01	1.8E+01	5.1E+01	7.7E+02	5.1E+03
Crotonaldehyde	123-73-9	4.5E-04	1.5E-03	4.5E-02	1.5E-01	3.4E+00	3.0E+01
Cumene (isopropylbenzene)	98-82-8	3.7E+00	1.0E+01	3.7E+02	1.0E+03	5.4E+03	9.0E+03
Cyanazine	21725-46-2	1.0E-03	3.4E-03	1.0E-01	3.4E-01	5.8E+00	3.4E+01
Cyanide	57-12-5	2.0E-01	2.0E-01	2.0E+01	2.0E+01	5.1E+03	3.7E+04
Cyanogen	460-19-5	1.5E+00	4.1E+00	1.5E+02	4.1E+02	4.3E+00	6.0E+00
Cyclohexane	110-82-7	1.8E+02	5.1E+02	1.8E+04	5.1E+04	2.0E-01	2.8E-01
Cyclohexanol	108-93-0	1.8E+02	5.1E+02	1.8E+04	5.1E+04	7.7E+05	5.1E+06

Updated Examples of Standard No. 2, Appendix II Medium-Specific Concentrations (MSCs)

(Last update: March 15, 2001)

Contaminant	CAS #	GW-Res (mg/l)	GW-Ind (mg/l)	GWP-Res (mg/kg)	GWP-Ind (mg/kg)	SAI-Res[a] (mg/kg)	SAI-Ind[a] (mg/kg)
Cyclohexanone	108-94-1	1.8E+02	5.1E+02	1.8E+04	5.1E+04	2.1E+03	3.0E+03
Cyclotetramethylenetetranitramine (HMX)	2691-41-0	1.8E+00	5.1E+00	1.8E+02	5.1E+02	1.4E+04	1.0E+05
Cyclotrimethylenetrinitramine (RDX)	121-82-4	7.7E-03	2.6E-02	7.7E-01	2.6E+00	3.6E+01	5.4E+01
Cymene (isopropyltoluene)	99-87-6	3.7E+00	1.0E+01	3.7E+02	1.0E+03	4.2E+03	6.7E+03
DDD	72-54-8	3.5E-04	1.2E-03	3.5E-02	1.2E-01	2.4E+00	1.8E+01
DDE	72-55-9	2.5E-04	8.4E-04	2.5E-02	8.4E-02	1.7E+00	1.3E+01
DDT	50-29-3	2.5E-04	8.4E-04	2.5E-02	8.4E-02	1.7E+00	1.2E+01
Di-n-butyl phthalate	84-74-2	3.7E+00	1.0E+01	3.7E+02	1.0E+03	1.5E+04	1.0E+05
Di-n-octyl phthalate	117-84-0	7.3E-01	2.0E+00	7.3E+01	2.0E+02	3.1E+03	2.0E+04
Diacetone alcohol (4-hydroxy-4-methyl-2-pentanone)	123-42-2	1.5E+00	4.1E+00	1.5E+02	4.1E+02	6.2E+03	4.1E+04
Diallate	2303-16-4	1.4E-03	4.7E-03	1.4E-01	4.7E-01	8.0E+00	4.7E+01
Diazinon	333-41-5	3.3E-02	9.2E-02	3.3E+00	9.2E+00	1.4E+02	9.2E+02
Dibenz(a,h)acridine	226-36-8	7.1E-05	2.4E-04	7.1E-03	2.4E-02	4.1E-01	2.4E+00
Dibenz-a,h-anthracene	53-70-3	2.0E-04	2.0E-04	2.0E-02	2.0E-02	6.3E-02	3.4E-01
Dibenzofuran	132-64-9	1.5E-01	4.1E-01	1.5E+01	4.1E+01	6.2E+02	4.1E+03
Dibromo-3-chloropropane, 1,2-	96-12-8	2.0E-04	2.0E-04	2.0E-02	2.0E-02	3.5E-01	2.0E+00
Dibromochloromethane	124-48-1	1.0E-01	1.0E-01	1.0E+01	1.0E+01	7.6E+01	6.8E+02
Dicamba	1918-00-9	1.1E+00	3.1E+00	1.1E+02	3.1E+02	4.6E+03	3.1E+04
Dichlorobenzene, 1,2-	95-50-1	6.0E-01	6.0E-01	6.0E+01	6.0E+01	2.6E+03	3.9E+03
Dichlorobenzene, 1,3-	541-73-1	1.1E+00	3.1E+00	1.1E+02	3.1E+02	5.1E+01	7.1E+01
Dichlorobenzene, 1,4-	106-46-7	7.5E-02	7.5E-02	7.5E+00	7.5E+00	2.7E+02	2.4E+03
Dichlorobenzidine, 3,3-	91-94-1	1.9E-04	6.4E-04	1.9E-02	6.4E-02	1.1E+00	6.4E+00
Dichloro-2-butene, 1,4-	764-41-0	---	---	---	---	2.3E-02	3.8E-02
Dichlorodifluoromethane	75-71-8	7.3E+00	2.0E+01	7.3E+02	2.0E+03	2.2E+03	3.1E+03
Dichloroethane, 1,1-	75-34-3	3.7E+00	1.0E+01	3.7E+02	1.0E+03	8.9E+02	1.3E+03
Dichloroethane, 1,2-	107-06-2	5.0E-03	5.0E-03	5.0E-01	5.0E-01	2.7E-01	4.7E-01
Dichloroethylene, 1,1-	75-35-4	7.0E-03	7.0E-03	7.0E-01	7.0E-01	6.0E-01	1.1E+00
Dichloroethylene, cis-1,2-	156-59-2	7.0E-02	7.0E-02	7.0E+00	7.0E+00	1.2E+03	2.5E+03
Dichloroethylene, trans-1,2	156-60-5	1.0E-01	1.0E-01	1.0E+01	1.0E+01	1.4E+03	2.4E+03
Dichlorophenol, 2,4-	120-83-2	1.1E-01	3.1E-01	1.1E+01	3.1E+01	4.6E+02	3.1E+03
Dichlorophenoxyacetic acid, 2,4- (2,4-D)	94-75-7	7.0E-02	7.0E-02	7.0E+00	7.0E+00	2.0E+03	1.4E+04
Dichloropropane, 1,2-	78-87-5	5.0E-03	5.0E-03	5.0E-01	5.0E-01	9.4E+00	2.5E+01
Dichloropropane, 1,3-	142-28-9	8.5E-03	2.9E-02	8.5E-01	2.9E+00	3.0E+01	8.0E+01
Dichloropropane, 2,2-	594-20-7	1.3E-02	4.2E-02	1.3E+00	4.2E+00	1.7E+01	2.4E+01
Dichloropropanol, 2,3-	616-23-9	1.1E-01	3.1E-01	1.1E+01	3.1E+01	4.6E+02	3.1E+03
Dichloropropene, 1,1-	563-58-6	8.5E-04	2.9E-03	8.5E-02	2.9E-01	9.9E-01	1.9E+00
Dichloropropene, cis 1,3-	10061-01-5	1.6E-03	5.3E-03	1.6E-01	5.3E-01	1.2E+01	3.4E+01
Dichloropropene, 1,3- (mixed isomers)	542-75-6	8.5E-04	2.9E-03	8.5E-02	2.9E-01	1.9E+00	4.2E+00
Dichloropropene, trans 1,3-	10061-02-6	8.5E-03	2.9E-02	8.5E-01	2.9E+00	1.8E+01	4.0E+01
Dichlorvos	62-73-7	2.9E-04	9.9E-04	2.9E-02	9.9E-02	1.7E+00	9.9E+00
Dicyclopentadiene	77-73-6	1.1E+00	3.1E+00	1.1E+02	3.1E+02	8.2E+03	6.1E+04
Dieldrin	60-57-1	5.3E-06	1.8E-05	5.3E-04	1.8E-03	3.1E-02	1.8E-01
Diethanolamine	111-42-2	1.8E-02	5.1E-02	1.8E+00	5.1E+00	7.7E+01	5.1E+02
Diethylene glycol monobutyl ether	112-34-5	3.3E+00	9.2E+00	3.3E+02	9.2E+02	1.4E+04	9.2E+04
Diethylhexyl adipate	103-23-1	7.1E-01	2.4E+00	7.1E+01	2.4E+02	4.1E+03	2.4E+04
Diethyl phthalate	84-66-2	2.9E+01	8.2E+01	2.9E+03	8.2E+03	1.2E+05	8.2E+05
Diethylstilbestrol	56-53-1	1.8E-08	6.1E-08	1.8E-06	6.1E-06	1.0E-04	6.1E-04
Dimethoate	60-51-5	7.3E-03	2.0E-02	7.3E-01	2.0E+00	3.1E+01	2.0E+02
Dimethoxybenzidine, 3,3'-	119-90-4	6.1E-03	2.0E-02	6.1E-01	2.0E+00	3.5E+01	2.0E+02
Dimethylbenzidine, 3,3'-	119-93-7	9.3E-06	3.1E-05	9.3E-04	3.1E-03	5.3E-02	3.1E-01
Dimethyl phenol, 2,4-	105-67-9	7.3E-01	2.0E+00	7.3E+01	2.0E+02	3.1E+03	2.0E+04

Updated Examples of Standard No. 2, Appendix II Medium-Specific Concentrations (MSCs)

(Last update: March 15, 2001)

Contaminant	CAS #	GW-Res (mg/l)	GW-Ind (mg/l)	GWP-Res (mg/kg)	GWP-Ind (mg/kg)	SAI-Res[a] (mg/kg)	SAI-Ind[a] (mg/kg)
Dimethylphthalate	131-11-3	2.9E+01	8.2E+01	2.9E+03	8.2E+03	1.2E+05	8.2E+05
Dinitrobenzene, 1,3- (dinitrobenzene, 2,4-)	99-65-0	3.7E-03	1.0E-02	3.7E-01	1.0E+00	1.5E+01	1.0E+02
Dinitrobenzene, 1,4-	100-25-4	1.5E-02	4.1E-02	1.5E+00	4.1E+00	6.2E+01	4.1E+02
Dinitro-2-methylphenol, 4,6- (dinitro-o-cresol, 4, 6-)	534-52-1	7.3E-02	2.0E-01	7.3E+00	2.0E+01	3.1E+02	2.0E+03
Dinitrophenol, 2,4-	51-28-5	7.3E-02	2.0E-01	7.3E+00	2.0E+01	3.1E+02	2.0E+03
Dinitrotoluene, 2,4-	121-14-2	1.3E-04	4.2E-04	1.3E-02	4.2E-02	7.2E-01	4.2E+00
Dinitrotoluene, 2,6-	606-20-2	1.3E-04	4.2E-04	1.3E-02	4.2E-02	7.2E-01	4.2E+00
Dinoseb	88-85-7	7.0E-03	7.0E-03	7.0E-01	7.0E-01	1.5E+02	1.0E+03
Dioxane 1,4-	123-91-1	7.7E-03	2.6E-02	7.7E-01	2.6E+00	5.8E+01	5.2E+02
Diphenylamine	122-39-4	9.1E-01	2.6E+00	9.1E+01	2.6E+02	3.9E+03	2.6E+04
Diphenylhydrazine, 1,2-	122-66-7	1.1E-04	3.6E-04	1.1E-02	3.6E-02	6.1E-01	3.6E+00
Diquat	85-00-7	2.0E-02	2.0E-02	2.0E+00	2.0E+00	3.4E+02	2.2E+03
Disulfoton	298-04-4	1.5E-03	4.1E-03	1.5E-01	4.1E-01	6.2E+00	4.1E+01
Diuron	330-54-1	7.3E-02	2.0E-01	7.3E+00	2.0E+01	3.1E+02	2.0E+03
Endosulfan	115-29-7	2.2E-01	6.1E-01	2.2E+01	6.1E+01	6.2E+01	9.2E+01
Endosulfan I	959-98-8	7.3E-02	2.0E-01	7.3E+00	2.0E+01	3.1E+02	2.0E+03
Endosulfan II	33213-65-9	2.2E-01	6.1E-01	2.2E+01	6.1E+01	9.3E+02	6.1E+03
Endosulfan sulfate	1031-07-8	2.2E-01	6.1E-01	2.2E+01	6.1E+01	9.3E+02	6.1E+03
Endothall	145-73-3	1.0E-01	1.0E-01	1.0E+01	1.0E+01	3.1E+03	2.0E+04
Endrin	72-20-8	2.0E-03	2.0E-03	2.0E-01	2.0E-01	4.6E+01	3.1E+02
Endrin aldehyde	7421-93-4	1.1E-02	3.1E-02	1.1E+00	3.1E+00	4.6E+01	3.1E+02
Endrin ketone	N-McG/D	1.1E-02	3.1E-02	1.1E+00	3.1E+00	4.6E+01	3.1E+02
Epichlorohydrin	106-89-8	8.6E-03	2.9E-02	8.6E-01	2.9E+00	7.2E+00	1.0E+01
Ethion	563-12-2	1.8E-02	5.1E-02	1.8E+00	5.1E+00	7.7E+01	5.1E+02
Ethoxy ethanol, 2-	110-80-5	1.5E+01	4.1E+01	1.5E+03	4.1E+03	4.3E+00	6.0E+00
Ethyl acetate	141-78-6	3.3E+01	9.2E+01	3.3E+03	9.2E+03	8.9E+03	1.3E+04
Ethyl acrylate	140-88-5	1.8E-03	6.0E-03	1.8E-01	6.0E-01	1.3E+01	1.2E+02
Ethyl benzene	100-41-4	7.0E-01	7.0E-01	7.0E+01	7.0E+01	4.3E+03	6.9E+03
Ethyl dipropylthiocarbamate, S-	759-94-4	9.1E-01	2.6E+00	9.1E+01	2.6E+02	3.9E+03	2.6E+04
Ethyl ether	60-29-7	7.3E+00	2.0E+01	7.3E+02	2.0E+03	3.8E+03	5.7E+03
Ethyl methacrylate	97-63-2	3.3E+00	9.2E+00	3.3E+02	9.2E+02	5.7E+03	9.9E+03
Ethyl-2-methyl benzene, 1-	611-14-3	7.3E+00	2.0E+01	7.3E+02	2.0E+03	5.5E+03	8.4E+03
Ethyl-4-methyl benzene, 1-	622-96-8	7.3E+00	2.0E+01	7.3E+02	2.0E+03	4.8E+03	7.2E+03
Ethylenediamine	107-15-3	7.3E-01	2.0E+00	7.3E+01	2.0E+02	5.5E+03	4.1E+04
Ethylene dibromide (dibromoethane, 1,2-)	106-93-4	5.0E-05	5.0E-05	5.0E-03	5.0E-03	7.2E-03	5.5E-02
Ethylene glycol	107-21-1	7.3E+01	2.0E+02	7.3E+03	2.0E+04	3.1E+05	2.0E+06
Ethylene oxide	75-21-8	8.3E-05	2.8E-04	8.3E-03	2.8E-02	7.5E-02	1.4E-01
Ethylene thiourea	96-45-7	7.7E-04	2.6E-03	7.7E-02	2.6E-01	4.4E+00	2.6E+01
Famphur	52-85-7	1.1E-03	3.1E-03	1.1E-01	3.1E-01	4.6E+00	3.1E+01
Fluoranthene	206-44-0	1.5E+00	4.1E+00	1.5E+02	4.1E+02	5.5E+03	3.6E+04
Fluorene	86-73-7	1.5E+00	4.1E+00	1.5E+02	4.1E+02	5.5E+03	3.6E+04
Fluorine (soluble fluoride)	7782-41-4	4.0E+00	4.0E+00	4.0E+02	4.0E+02	1.5E+04	1.1E+05
Formaldehyde	50-00-0	7.3E+00	2.0E+01	7.3E+02	2.0E+03	5.5E+04	4.1E+05
Formic acid	64-18-6	7.3E+01	2.0E+02	7.3E+03	2.0E+04	5.5E+05	4.1E+06
Furan	110-00-9	3.7E-02	1.0E-01	3.7E+00	1.0E+01	3.9E+01	6.1E+01
Furfural	98-01-1	1.1E-01	3.1E-01	1.1E+01	3.1E+01	8.2E+02	6.1E+03
Glycidylaldehyde	765-34-4	1.5E-02	4.1E-02	1.5E+00	4.1E+00	1.1E+02	8.2E+02
Heptachlor	76-44-8	4.0E-04	4.0E-04	4.0E-02	4.0E-02	9.3E-02	4.1E-01
Heptachlor epoxide	1024-57-3	2.0E-04	2.0E-04	2.0E-02	2.0E-02	5.4E-02	3.1E-01
Hexachlorobenzene	118-74-1	1.0E-03	1.0E-03	1.0E-01	1.0E-01	2.5E-01	1.0E+00
Hexachlorobutadiene	87-68-3	7.3E-03	2.0E-02	7.3E-01	2.0E+00	1.6E+01	3.2E+01

Updated Examples of Standard No. 2, Appendix II Medium-Specific Concentrations (MSCs)

(Last update: March 15, 2001)

Contaminant	CAS #	GW-Res (mg/l)	GW-Ind (mg/l)	GWP-Res (mg/kg)	GWP-Ind (mg/kg)	SAI-Res[a] (mg/kg)	SAI-Ind[a] (mg/kg)
Hexachlorocyclohexane, alpha (alpha-BHC)	319-84-6	1.4E-05	4.5E-05	1.4E-03	4.5E-03	9.0E-02	6.5E-01
Hexachlorocyclohexane, beta (beta-BHC)	319-85-7	4.7E-04	1.6E-03	4.7E-02	1.6E-01	3.2E+00	2.3E+01
Hexachlorocyclohexane, gamma (lindane; gamma-BH(	58-89-9	2.0E-04	2.0E-04	2.0E-02	2.0E-02	4.4E-01	3.1E+00
Hexachlorocyclohexane, delta (delta-BHC)	319-86-8	4.7E-05	1.6E-04	4.7E-03	1.6E-02	3.2E-01	2.3E+00
Hexachlorocyclohexane, techn (technical-BHC)	608-73-1	4.7E-05	1.6E-04	4.7E-03	1.6E-02	3.2E-01	2.3E+00
Hexachlorocyclopentadiene	77-47-4	5.0E-02	5.0E-02	5.0E+00	5.0E+00	3.6E+00	5.0E+00
Hexachloroethane	67-72-1	3.7E-02	1.0E-01	3.7E+00	1.0E+01	1.5E+02	7.5E+02
Hexachlorophene	70-30-4	1.1E-02	3.1E-02	1.1E+00	3.1E+00	4.6E+01	3.1E+02
Hexane, n-	110-54-3	2.2E+00	6.1E+00	2.2E+02	6.1E+02	5.7E+01	8.1E+01
Hexanediol, 1,6-	629-11-8	1.8E+02	5.1E+02	1.8E+04	5.1E+04	7.7E+05	5.1E+06
Hexanoic acid	142-62-1	1.8E+02	5.1E+02	1.8E+04	5.1E+04	7.7E+05	5.1E+06
Hexanone, 2-	591-78-6	2.2E+00	6.1E+00	2.2E+02	6.1E+02	6.2E+01	8.7E+01
Hexazinone	51235-04-2	1.2E+00	3.4E+00	1.2E+02	3.4E+02	5.1E+03	3.4E+04
Hexylene glycol (2-methyl-2,4-pentanediol)	107-41-5	1.1E+01	3.1E+01	1.1E+03	3.1E+03	4.6E+04	3.1E+05
Hydrazine	302-01-2	2.8E-05	9.5E-05	2.8E-03	9.5E-03	2.1E-01	1.9E+00
Indene	95-13-6	7.3E-01	2.0E+00	7.3E+01	2.0E+02	7.9E+01	1.1E+02
Indeno-1,2,3-cd-pyrene	193-39-5	2.0E-04	3.9E-04	2.0E-02	3.9E-02	6.3E-01	3.4E+00
Isobutyl alcohol	78-83-1	1.1E+01	3.1E+01	1.1E+03	3.1E+03	3.0E+03	4.3E+03
Isodrin	465-73-6	5.0E-06	1.7E-05	5.0E-04	1.7E-03	2.8E-02	1.6E-01
Isopropyl alcohol	67-63-0	7.3E+00	2.0E+01	7.3E+02	2.0E+03	5.5E+04	4.1E+05
Isophorone	78-59-1	9.0E-01	3.0E+00	9.0E+01	3.0E+02	5.2E+03	3.0E+04
Kepone (chlordecone)	143-50-0	5.3E-06	1.8E-05	5.3E-04	1.8E-03	3.1E-02	1.8E-01
Lead (inorganic)	7439-92-1	1.5E-02	1.5E-02	1.5E+00	1.5E+00	5.0E+02[d]	1.0E+03[d]
Lithium	7439-93-2	4.7E+00	1.3E+01	4.7E+02	1.3E+03	3.3E+04	2.4E+05
Malathion	121-75-5	7.3E-01	2.0E+00	7.3E+01	2.0E+02	3.1E+03	2.0E+04
Maleic anhydride	108-31-6	3.7E+00	1.0E+01	3.7E+02	1.0E+03	1.5E+04	1.0E+05
Maleic hydrazide	123-33-1	1.8E+01	5.1E+01	1.8E+03	5.1E+03	7.7E+04	5.1E+05
Malononitrile	109-77-3	7.3E-04	2.0E-03	7.3E-02	2.0E-01	3.1E+00	2.0E+01
Manganese	7439-96-5	1.7E+00	1.4E+01	1.7E+02	1.4E+03	1.7E+04	1.1E+05
Mercury (pH = 4.9)	7439-97-6	2.0E-03	2.0E-03	2.0E-01	2.0E-01	1.1E-01	1.5E-01
Mercury (pH = 6.8)	7439-97-6	2.0E-03	2.0E-03	2.0E-01	2.0E-01	6.1E+00	9.6E+00
Methacrylic acid (2-methyl-2-propenoic acid)	79-41-4	3.7E-01	1.0E+00	3.7E+01	1.0E+02	2.4E+01	3.4E+01
Methacrylonitrile	126-98-7	3.7E-03	1.0E-02	3.7E-01	1.0E+00	1.1E+01	2.2E+01
Methanol	67-56-1	1.8E+01	5.1E+01	1.8E+03	5.1E+03	1.4E+05	1.0E+06
Methomyl	16752-77-5	9.1E-01	2.6E+00	9.1E+01	2.6E+02	3.9E+03	2.6E+04
Methoxychlor	72-43-5	4.0E-02	4.0E-02	4.0E+00	4.0E+00	7.5E+02	4.4E+03
Methoxyethanol, 2-	109-86-4	---	---	---	---	6.1E+00	8.5E+00
Methyl acetate (acetic acid, methyl ester)	79-20-9	1.5E+00	4.1E+00	1.5E+02	4.1E+02	1.8E+03	2.9E+03
Methyl chrysene, 1-	3351-28-8	1.2E-01	3.9E-01	1.2E+01	3.9E+01	6.3E+02	3.4E+03
Methyl chrysene, 2-	3351-32-4	1.2E-01	3.9E-01	1.2E+01	3.9E+01	6.3E+02	3.4E+03
Methyl cyclohexane	108-87-2	1.8E+02	5.1E+02	1.8E+04	5.1E+04	3.8E+03	5.3E+03
Methyl ethyl ketone (2-butanone)	78-93-3	2.2E+01	6.1E+01	2.2E+03	6.1E+03	6.0E+03	8.6E+03
Methyl iodide (iodomethane)	74-88-4	5.1E-02	1.4E-01	5.1E+00	1.4E+01	1.8E+01	2.6E+01
Methyl isobutyl ketone	108-10-1	2.9E+00	8.2E+00	2.9E+02	8.2E+02	2.0E+03	2.9E+03
Methyl mercury	22967-92-6	3.7E-03	1.0E-02	3.7E-01	1.0E+00	2.5E+01	1.9E+02
Methyl methacrylate	80-62-6	5.1E+01	1.4E+02	5.1E+03	1.4E+04	5.8E+03	8.2E+03
Methylpyrrolidone, N-	872-50-4	7.3E-01	2.0E+00	7.3E+01	2.0E+02	3.1E+03	2.0E+04
Methylnaphthalene, 1-	90-12-0	7.3E-01	2.0E+00	7.3E+01	2.0E+02	2.7E+03	1.8E+04
Methylnaphthalene, 2-	91-57-6	7.3E-01	2.0E+00	7.3E+01	2.0E+02	2.7E+03	1.8E+04
Methyl parathion	298-00-0	9.1E-03	2.6E-02	9.1E-01	2.6E+00	3.9E+01	2.6E+02
Methylene bromide (dibromomethane)	74-95-3	1.1E-01	3.8E-01	1.1E+01	3.8E+01	1.9E+02	2.7E+02

Updated Examples of Standard No. 2, Appendix II Medium-Specific Concentrations (MSCs)

(Last update: March 15, 2001)

Contaminant	CAS #	GW-Res (mg/l)	GW-Ind (mg/l)	GWP-Res (mg/kg)	GWP-Ind (mg/kg)	SAI-Res[a] (mg/kg)	SAI-Ind[a] (mg/kg)
Methylene-bis (2-chloroaniline) 4,4'-	101-14-4	6.6E-04	2.2E-03	6.6E-02	2.2E-01	3.8E+00	2.2E+01
Methylene chloride (dichloromethane)	75-09-2	5.0E-03	5.0E-03	5.0E-01	5.0E-01	8.7E+00	1.6E+01
Methyltetrahydrofuran, 2-	96-47-9	1.1E-01	3.8E-01	1.1E+01	3.8E+01	7.0E+01	1.3E+02
Methyltetrahydropyran, 2-	10141-72-7	1.1E-01	3.8E-01	1.1E+01	3.8E+01	1.1E+02	2.0E+02
Metolachlor	51218-45-2	5.5E+00	1.5E+01	5.5E+02	1.5E+03	2.3E+04	1.5E+05
Molinate	2212-67-1	7.3E-02	2.0E-01	7.3E+00	2.0E+01	3.1E+02	2.0E+03
Molybdenum	7439-98-7	1.8E-01	5.1E-01	1.8E+01	5.1E+01	1.1E+03	8.1E+03
Morpholine	110-91-8	1.8E+04	5.1E+04	1.8E+06	5.1E+06	1.4E+08	1.0E+09
MTBE	1634-04-4	3.7E-01/ 1.5E-02[e]	1.0E+00/ 1.5E-02[e]	3.7E+01	1.0E+02	1.5E+03	3.7E+03
Naled	300-76-5	7.3E-02	2.0E-01	7.3E+00	2.0E+01	1.1E+02	2.2E+02
Naphthalene	91-20-3	7.3E-01	2.0E+00	7.3E+01	2.0E+02	1.8E+02	2.7E+02
Nickel and compounds	7440-02-0	7.3E-01	2.0E+00	7.3E+01	2.0E+02	1.9E+03	1.2E+04
Nitrate	14797-55-8	1.0E+01	1.0E+01	1.0E+03	1.0E+03	4.1E+05	3.0E+06
Nitrite	14797-65-0	1.0E+00	1.0E+00	1.0E+02	1.0E+02	2.5E+04	1.9E+05
Nitroaniline, 2-	88-74-4	1.1E-02	3.1E-02	1.1E+00	3.1E+00	4.6E+01	3.1E+02
Nitroaniline, 3-	99-09-2	1.1E-02	3.1E-02	1.1E+00	3.1E+00	4.6E+01	3.1E+02
Nitroaniline, 4-	100-01-6	2.2E-02	7.5E-02	2.2E+00	7.5E+00	1.3E+02	7.5E+02
Nitrobenzene	98-95-3	1.8E-02	5.1E-02	1.8E+00	5.1E+00	6.5E+01	2.7E+02
Nitropropane, 2-	79-46-9	---	---	---	---	4.2E-03	7.0E-03
Nitroso-n-ethylurea, n-	759-73-9	6.1E-07	2.0E-06	6.1E-05	2.0E-04	3.5E-03	2.0E-02
Nitroso-methyl-ethyl-amine, n-	10595-95-6	3.9E-06	1.3E-05	3.9E-04	1.3E-03	2.9E-02	2.6E-01
Nitrosodi-n-butylamine, n-	924-16-3	1.6E-05	5.3E-05	1.6E-03	5.3E-03	4.1E-02	1.0E-01
Nitrosodi-n-propylamine, n-	621-64-7	1.2E-05	4.1E-05	1.2E-03	4.1E-03	4.1E-02	1.6E-01
Nitrosodiethanolamine	1116-54-7	3.0E-05	1.0E-04	3.0E-03	1.0E-02	1.7E-01	1.0E+00
Nitrosodiethylamine, n-	55-18-5	5.7E-07	1.9E-06	5.7E-05	1.9E-04	4.3E-03	3.8E-02
Nitrosodimethylamine, n-	62-75-9	1.7E-06	5.6E-06	1.7E-04	5.6E-04	1.3E-02	1.1E-01
Nitrosodiphenylamine	86-30-6	1.7E-02	5.8E-02	1.7E+00	5.8E+00	5.9E+01	2.3E+02
Nitrophenol, 2-	88-75-5	7.3E-02	2.0E-01	7.3E+00	2.0E+01	3.1E+02	2.0E+03
Nitrophenol, 4-	100-02-7	7.3E-02	2.0E-01	7.3E+00	2.0E+01	3.1E+02	2.0E+03
Nitrosopyrrolidine, n-	930-55-2	4.1E-05	1.4E-04	4.1E-03	1.4E-02	2.3E-01	1.4E+00
Nitrotoluene, m-	99-08-1	3.7E-01	1.0E+00	3.7E+01	1.0E+02	4.4E+02	7.9E+02
Nitrotoluene, o-	88-72-2	3.7E-01	1.0E+00	3.7E+01	1.0E+02	4.7E+02	8.6E+02
Nitrotoluene, p-	99-99-0	3.7E-01	1.0E+00	3.7E+01	1.0E+02	4.4E+02	7.9E+02
Octamethylpyrophosphoramide	152-16-9	7.3E-02	2.0E-01	7.3E+00	2.0E+01	3.1E+02	2.0E+03
Oxamyl	23135-22-0	2.0E-01	2.0E-01	2.0E+01	2.0E+01	3.9E+03	2.6E+04
Parathion (ethyl parathion)	56-38-2	2.2E-01	6.1E-01	2.2E+01	6.1E+01	9.3E+02	6.1E+03
Pebulate	1114-71-2	1.8E+00	5.1E+00	1.8E+02	5.1E+02	7.7E+03	5.1E+04
Pendimethalin	40487-42-1	1.5E+00	4.1E+00	1.5E+02	4.1E+02	6.2E+03	4.1E+04
Pentachlorobenzene	608-93-5	2.9E-02	8.2E-02	2.9E+00	8.2E+00	1.2E+02	8.0E+02
Pentachloronitrobenzene	82-68-8	3.3E-03	1.1E-02	3.3E-01	1.1E+00	1.9E+01	1.1E+02
Pentachlorophenol	87-86-5	1.0E-03	1.0E-03	1.0E-01	1.0E-01	3.0E+00	1.4E+01
Pentanediol, 1,5-	111-29-5	1.8E+02	5.1E+02	1.8E+04	5.1E+04	7.7E+05	5.1E+06
Perchlorate	NA	2.2E-02[f]	9.2E-02	2.2E+00[f]	9.2E+00	6.6E+01[f]	1.2E+03
Phenanthrene	85-01-8	1.1E+00	3.1E+00	1.1E+02	3.1E+02	4.1E+03	2.7E+04
Phenol	108-95-2	2.2E+01	6.1E+01	2.2E+03	6.1E+03	9.3E+04	6.1E+05
Phenyl mercuric acetate	62-38-4	2.9E-03	8.2E-03	2.9E-01	8.2E-01	1.2E+01	8.2E+01
Phenylene diamine, m-	108-45-2	2.2E-01	6.1E-01	2.2E+01	6.1E+01	9.3E+02	6.1E+03
Phenylene diamine, p-	106-50-3	6.9E+00	1.9E+01	6.9E+02	1.9E+03	2.9E+04	1.9E+05
Phorate	298-02-2	7.3E-03	2.0E-02	7.3E-01	2.0E+00	1.6E+01	3.8E+01
Phosphine	7803-51-2	1.1E-02	3.1E-02	1.1E+00	3.1E+00	5.9E+01	4.1E+02

Updated Examples of Standard No. 2, Appendix II Medium-Specific Concentrations (MSCs)

(Last update: March 15, 2001)

Contaminant	CAS #	GW-Res (mg/l)	GW-Ind (mg/l)	GWP-Res (mg/kg)	GWP-Ind (mg/kg)	SAI-Res[a] (mg/kg)	SAI-Ind[a] (mg/kg)
Phosphorus, white	7723-14-0	7.3E-04	2.0E-03	7.3E-02	2.0E-01	4.0E+00	2.7E+01
Phthalic anhydride	85-44-9	7.3E+01	2.0E+02	7.3E+03	2.0E+04	3.1E+05	2.0E+06
Polybrominated biphenyls (PBBs)	67774-32-7	9.6E-06	3.2E-05	9.6E-04	3.2E-03	5.5E-02	3.2E-01
Polychlorinated biphenyls (PCBs)	1336-36-3	5.0E-04	5.0E-04	5.0E-02	5.0E-02	1.0E+01[g]	1.0E+01[g]
Pronamide	23950-58-5	2.7E+00	7.7E+00	2.7E+02	7.7E+02	1.2E+04	7.7E+04
Propargite	2312-35-8	7.3E-01	2.0E+00	7.3E+01	2.0E+02	3.1E+03	2.0E+04
Propargyl alcohol	107-19-7	7.3E-02	2.0E-01	7.3E+00	2.0E+01	5.5E+02	4.1E+03
Propham	122-42-9	7.3E-01	2.0E+00	7.3E+01	2.0E+02	3.1E+03	2.0E+04
Propionitrile (propane nitrile)	107-12-0	1.5E-02	4.1E-02	1.5E+00	4.1E+00	4.3E+01	8.9E+01
Propylbenzene, n-	103-65-1	1.5E+00	4.1E+00	1.5E+02	4.1E+02	3.2E+03	5.9E+03
Propylene glycol	57-55-6	7.3E+02	2.0E+03	7.3E+04	2.0E+05	3.1E+06	2.0E+07
Propylene glycol monomethyl ether	107-98-2	2.6E+01	7.2E+01	2.6E+03	7.2E+03	1.9E+05	1.4E+06
Propylene oxide	75-56-9	3.5E-04	1.2E-03	3.5E-02	1.2E-01	1.2E+00	3.1E+00
Pyrene	129-00-0	1.1E+00	3.1E+00	1.1E+02	3.1E+02	4.1E+03	2.7E+04
Pyridine	110-86-1	3.7E-02	1.0E-01	3.7E+00	1.0E+01	8.2E+00	1.2E+01
Quinoline	91-22-5	7.1E-05	2.4E-04	7.1E-03	2.4E-02	4.1E-01	2.4E+00
Selenium	7782-49-2	5.0E-02	5.0E-02	5.0E+00	5.0E+00	1.3E+03	9.3E+03
Selenourea	630-10-4	1.8E-01	5.1E-01	1.8E+01	5.1E+01	1.4E+03	1.0E+04
Silver	7440-22-4	1.8E-01	5.1E-01	1.8E+01	5.1E+01	4.7E+02	2.9E+03
Sodium diethyldithiocarbamate	148-18-5	3.2E-03	1.1E-02	3.2E-01	1.1E+00	2.4E+01	2.1E+02
Strychnine	57-24-9	1.1E-02	3.1E-02	1.1E+00	3.1E+00	4.6E+01	3.1E+02
Styrene	100-42-5	1.0E-01	1.0E-01	1.0E+01	1.0E+01	1.3E+04	2.3E+04
Sulfolane	126-33-0	7.3E-04	2.0E-03	7.3E-02	2.0E-01	3.1E+00	2.0E+01
Tert-amyl-methyl ether (TAME)	994-05-8	1.5E+00	4.1E+00	1.5E+02	4.1E+02	1.1E+04	8.2E+04
Tetrachlorobenzene, 1,2,3,5-	634-90-2	1.1E-02	3.1E-02	1.1E+00	3.1E+00	4.6E+01	3.1E+02
Tetrachlorobenzene, 1,2,4,5-	95-94-3	1.1E-02	3.1E-02	1.1E+00	3.1E+00	4.6E+01	3.0E+02
Tetrachloroethane, 1,1,1,2-	630-20-6	3.3E-02	1.1E-01	3.3E+00	1.1E+01	5.2E+01	1.0E+02
Tetrachloroethane, 1,1,2,2-	79-34-5	4.3E-03	1.4E-02	4.3E-01	1.4E+00	5.1E+00	9.8E+00
Tetrachloroethylene	127-18-4	5.0E-03	5.0E-03	5.0E-01	5.0E-01	6.0E+00	1.7E+01
Tetrachlorophenol, 2,3,4,6-	58-90-2	1.1E+00	3.1E+00	1.1E+02	3.1E+02	4.6E+03	3.1E+04
Tetraethyl dithiopyrophosphate (Sulfotep)	3689-24-5	1.8E-02	5.1E-02	1.8E+00	5.1E+00	7.7E+01	5.1E+02
Tetrahydrofuran	109-99-9	1.1E-01	3.8E-01	1.1E+01	3.8E+01	5.4E+01	9.5E+01
Tetrahydropyran	142-68-7	1.1E-01	3.8E-01	1.1E+01	3.8E+01	8.5E+01	1.5E+02
Tetraethyl lead	78-00-2	3.7E-06	1.0E-05	3.7E-04	1.0E-03	1.5E-02	9.7E-02
Thallium and compounds (as thallium chloride)	7791-12-0	2.0E-03	2.0E-03	2.0E-01	2.0E-01	2.0E+01	1.5E+02
Thiofanox	39196-18-4	1.1E-02	3.1E-02	1.1E+00	3.1E+00	4.6E+01	3.1E+02
Thiophanate-methyl	23564-05-8	2.9E+00	8.2E+00	2.9E+02	8.2E+02	1.2E+04	8.2E+04
Thiram	137-26-8	1.8E-01	5.1E-01	1.8E+01	5.1E+01	7.7E+02	5.1E+03
Tin	7440-31-5	2.2E+01	6.1E+01	2.2E+03	6.1E+03	9.3E+04	6.1E+05
Titanium	7440-32-6	1.8E+04	5.1E+04	1.8E+06	5.1E+06	3.8E+07	2.4E+08
Toluene	108-88-3	1.0E+00	1.0E+00	1.0E+02	1.0E+02	1.7E+03	2.4E+03
Toluenediamine, 2,4-	95-80-7	2.7E-05	8.9E-05	2.7E-03	8.9E-03	1.5E-01	8.9E-01
Toluenediamine, 2,6-	823-40-5	7.3E+00	2.0E+01	7.3E+02	2.0E+03	3.1E+04	2.0E+05
Toluene diisocyanate, 2,4/2,6-	26471-62-5	---	---	---	---	2.9E+02	4.1E+02
Toluidine, p-	106-49-0	4.5E-03	1.5E-02	4.5E-01	1.5E+00	2.6E+01	1.5E+02
Toxaphene	8001-35-2	3.0E-03	3.0E-03	3.0E-01	3.0E-01	4.4E-01	2.6E+00
TP Silvex, 2,4,5-	93-72-1	5.0E-02	5.0E-02	5.0E+00	5.0E+00	1.2E+03	8.2E+03
Triallate	2303-17-5	4.7E-01	1.3E+00	4.7E+01	1.3E+02	2.0E+03	1.3E+04
Triaminotrinitrobenzene (TATB)	3058-38-6	2.8E-02	9.5E-02	2.8E+00	9.5E+00	1.6E+02	9.5E+02
Tributyltin oxide	56-35-9	1.1E-02	3.1E-02	1.1E+00	3.1E+00	4.6E+01	3.1E+02
Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1	1.1E+03	3.1E+03	1.1E+05	3.1E+05	4.3E+04	6.0E+04

Updated Examples of Standard No. 2, Appendix II Medium-Specific Concentrations (MSCs)

(Last update: March 15, 2001)

Contaminant	CAS #	GW-Res (mg/l)	GW-Ind (mg/l)	GWP-Res (mg/kg)	GWP-Ind (mg/kg)	SAI-Res[a] (mg/kg)	SAI-Ind[a] (mg/kg)
Trichlorobenzene, 1,2,3-	87-61-6	1.1E-01	3.1E-01	1.1E+01	3.1E+01	4.2E+02	2.0E+03
Trichlorobenzene, 1,2,4-	120-82-1	7.0E-02	7.0E-02	7.0E+00	7.0E+00	1.4E+03	6.1E+03
Trichlorobenzene, 1,3,5-	108-70-3	1.1E-01	3.1E-01	1.1E+01	3.1E+01	3.7E+02	1.4E+03
Trichloroethane, 1,1,1-	71-55-6	2.0E-01	2.0E-01	2.0E+01	2.0E+01	2.3E+03	3.4E+03
Trichloroethane, 1,1,2-	79-00-5	5.0E-03	5.0E-03	5.0E-01	5.0E-01	9.7E+00	1.7E+01
Trichloroethylene	79-01-6	5.0E-03	5.0E-03	5.0E-01	5.0E-01	3.7E+00	6.6E+00
Trichlorofluoromethane	75-69-4	1.1E+01	3.1E+01	1.1E+03	3.1E+03	2.6E+03	3.8E+03
Trichlorophenol, 2,4,5-	95-95-4	3.7E+00	1.0E+01	3.7E+02	1.0E+03	1.5E+04	1.0E+05
Trichlorophenol, 2,4,6-	88-06-2	7.7E-03	2.6E-02	7.7E-01	2.6E+00	4.4E+01	2.6E+02
Trichlorophenoxyacetic acid, 2,4,5-	93-76-5	3.7E-01	1.0E+00	3.7E+01	1.0E+02	1.5E+03	1.0E+04
Trichloropropane, 1,1,2-	598-77-6	1.8E-01	5.1E-01	1.8E+01	5.1E+01	1.7E+02	2.7E+02
Trichloropropane, 1,2,3-	96-18-4	1.2E-05	4.1E-05	1.2E-03	4.1E-03	9.1E-02	8.2E-01
Triethanolamine	102-71-6	7.3E+00	2.0E+01	7.3E+02	2.0E+03	3.1E+04	2.0E+05
Triethylamine	121-44-8	---	---	---	---	3.7E+01	5.2E+01
Triethylphosphorothioate, O, O, O-	126-68-1	3.0E-04	8.5E-04	3.0E-02	8.5E-02	1.3E+00	8.5E+00
Trifluralin	1582-09-8	1.1E-01	3.7E-01	1.1E+01	3.7E+01	6.4E+02	3.7E+03
Trimethylbenzene, 1,2,3-	526-73-8	1.8E+00	5.1E+00	1.8E+02	5.1E+02	8.6E+01	1.2E+02
Trimethylbenzene, 1,2,4-	95-63-6	1.8E+00	5.1E+00	1.8E+02	5.1E+02	9.6E+01	1.4E+02
Trimethylbenzene, 1,3,5-	108-67-8	1.8E+00	5.1E+00	1.8E+02	5.1E+02	8.3E+01	1.2E+02
Trinitrobenzene, 1,3,5-	99-35-4	1.1E+00	3.1E+00	1.1E+02	3.1E+02	4.6E+03	3.1E+04
Trinitrophenylmethylnitramine (tetryl; nitramine)	479-45-8	3.7E-01	1.0E+00	3.7E+01	1.0E+02	1.5E+03	1.0E+04
Trinitrotoluene, 2,4,6-	118-96-7	1.8E-02	5.1E-02	1.8E+00	5.1E+00	7.7E+01	5.1E+02
Uranium (soluble salts)	7440-61-1	2.0E-02	2.0E-02	2.0E+00	2.0E+00	7.6E+02	5.6E+03
Valeric acid (pentanoic acid)	109-52-4	1.8E+02	5.1E+02	1.8E+04	5.1E+04	7.7E+05	5.1E+06
Vanadium	7440-62-2	2.6E-01	7.2E-01	2.6E+01	7.2E+01	4.8E+02	3.0E+03
Vernam	1929-77-7	3.7E-02	1.0E-01	3.7E+00	1.0E+01	1.5E+02	1.0E+03
Vinyl acetate	108-05-4	3.7E+01	1.0E+02	3.7E+03	1.0E+04	5.7E+02	8.0E+02
Vinyl chloride	75-01-4	2.0E-03	2.0E-03	2.0E-01	2.0E-01	3.6E-02	6.6E-02
Warfarin	81-81-2	1.1E-02	3.1E-02	1.1E+00	3.1E+00	4.6E+01	3.1E+02
Xylene, m-	108-38-3	1.0E+01	1.0E+01	1.0E+03	1.0E+03	2.3E+03	3.3E+03
Xylene, o-	95-47-6	1.0E+01	1.0E+01	1.0E+03	1.0E+03	3.3E+04	4.8E+04
Xylene, p-	106-42-3	1.0E+01	1.0E+01	1.0E+03	1.0E+03	2.7E+03	3.8E+03
Xylenes	1330-20-7	1.0E+01	1.0E+01	1.0E+03	1.0E+03	2.6E+03	3.6E+03
Zinc	7440-66-6	1.1E+01	3.1E+01	1.1E+03	3.1E+03	5.9E+04	4.1E+05
6 C aliphatics (TPH)	NA	2.2E+00	6.1E+00	2.2E+02	6.1E+02	1.5E+02	2.1E+02
>6-8 C aliphatics (TPH)	NA	2.2E+00	6.1E+00	2.2E+02	6.1E+02	3.0E+02	4.2E+02
>8-10 C aliphatics (TPH)	NA	3.7E+00	1.0E+01	3.7E+02	1.0E+03	3.1E+03	4.8E+03
>10-12 C aliphatics (TPH)	NA	3.7E+00	1.0E+01	3.7E+02	1.0E+03	5.3E+03	1.0E+04
>12-16 C aliphatics (TPH)	NA	3.7E+00	1.0E+01	3.7E+02	1.0E+03	8.2E+03	2.0E+04
>16-21 C aliphatics (TPH)	NA	7.3E+01	2.0E+02	7.3E+03	2.0E+04	3.1E+05	2.0E+06
>16-21 C, >21-35 C aliphatics (TPH) (for transformer mineral oil releases only)	NA	5.8E+01	1.6E+02	5.8E+03	1.6E+04	2.5E+05	1.6E+06
>7-8 C aromatics (TPH)	NA	3.7E+00	1.0E+01	3.7E+02	1.0E+03	3.7E+03	5.8E+03
>8-10 C aromatics (TPH)	NA	1.5E+00	4.1E+00	1.5E+02	4.1E+02	1.7E+03	2.8E+03
>10-12 C aromatics (TPH)	NA	1.5E+00	4.1E+00	1.5E+02	4.1E+02	2.7E+03	5.8E+03
>12-16 C aromatics (TPH)	NA	1.5E+00	4.1E+00	1.5E+02	4.1E+02	4.0E+03	1.1E+04
>16-21 C aromatics (TPH)	NA	1.1E+00	3.1E+00	1.1E+02	3.1E+02	4.1E+03	2.7E+04
>21-35 C aromatics (TPH)	NA	1.1E+00	3.1E+00	1.1E+02	3.1E+02	4.1E+03	2.7E+04

Footnotes

Updated Examples of Standard No. 2, Appendix II Medium-Specific Concentrations (MSCs)

(Last update: March 15, 2001)

Contaminant	CAS #	GW-Res (mg/l)	GW-Ind (mg/l)	GWP-Res (mg/kg)	GWP-Ind (mg/kg)	SAI-Res[a] (mg/kg)	SAI-Ind[a] (mg/kg)

[a]SAI was originally defined as "Soil/Air and Ingestion Standard." However, the SAI values provided in this table include the soil dermal absorption pathway where appropriate as well.

[b]The SAI-Res (20 mg/kg) and SAI-Ind (200 mg/kg) values for arsenic are based on the cleanup levels established by the Executive Director (interoffice memos entitled "Arsenic Soil Cleanup Standards" from Dan Pearson on May 19, 1995 and "Arsenic Soil Cleanup Standards for Commercial/Industrial Areas" from Jeff Saitas on September 11, 1998, respectively).

[c]The SAI-Res MSC value for cadmium does NOT account for vegetable ingestion. Please include this pathway when warranted due to site-specific conditions.

[d]The SAI-Res and SAI-Ind values for lead were calculated using the USEPA Lead Uptake/Biokinetic Model and the USEPA Model for Assessing Risks Associated with Adult Exposures to Lead in Soil, respectively.

[e]The first value for MTBE represents the health-based value; the second value for MTBE is based on odor and taste.

[f]The GW-Res, GWP-Res, and SAI-res values for perchlorate are specifically set to address a childhood exposure scenario, due to the potential for the unique toxicity of perchlorate to children.

[g]The SAI-Res and SAI-Ind value for PCBs (10 mg/kg) is based on the TSCA limit defined in 40 CFR 761.125. An alternate cleanup level of 25 mg/kg may be appropriate for certain industrial sites, provided the site meets the requirements for a restricted access site (i.e., > 0.1 km from a residential/commercial area limited by man-made barriers) as defined in TSCA 40 CFR 761.123.

Appendix H

Texas Specific Background Concentrations

Texas Natural Resource Conservation Commission

INTEROFFICE MEMORANDUM

To: Remediation Division Project Managers

Date: June 28, 2000

Thru: Jacqueline S. Hardee, P.E., Director *(Initialed JSH)*
Remediation Division

From: Chet Clarke, Manager *(Initialed WDC)*
Technical Support Section

Subject: Using non-site specific background assumptions under the 30 TAC 335 Risk Reduction Rules.

As stated in Section VI.3 of the TNRCC Interoffice Memorandum dated July 23, 1998, regarding Implementation of the Existing Risk Reduction Rule, commonly referred to as the "Consistency Document," background concentrations established under the Risk Reduction Rule (30 TAC 335) must be established site-specifically and that Soil Conservation Survey or U.S. Geological Survey reports should not be used to characterize site-specific background for soils. The general policy regarding background as stated in the Consistency Document stands but is now modified to address situations when background cannot be established site-specifically. These situations are limited to sites without appropriate locations being available, due to the extent of contamination from releases or presence of physical barriers, to collect natural background concentration data which are reasonably proximal or within the same environmental media as the affected media of interest. In situations where there are no appropriate locations to collect natural background concentration data, persons may use the following table to determine background concentrations. Otherwise, the person must set background site-specifically. Quantification of anthropogenic background likely will not be influenced by these location constraints and should continue to be based on sample locations beyond the release site.

Texas-Specific Background Concentration	
Metal	Median Background Concentration (mg/kg)
Aluminum	30,000
Antimony	1
Arsenic	5.9
Barium	300
Beryllium	1.5

Boron	30
Total Chromium	30
Cobalt	7
Copper	15
Fluorine	190
Iron	15,000
Lead	15
Manganese	300
Mercury	0.04
Nickel	10
Selenium	0.3
Strontium	100
Tin	0.9
Titanium	2,000
Thallium	9.3
Vanadium	50
Zinc	30

Additional constituents may be added to this table as information becomes available.

Appendix I

TNRCC Letter
September 24, 2001

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

September 24, 2001

Ms. Lisa Lawson
Project Manager
Department of the Army
U.S. Corps of Engineers, Tulsa District
1645 South 101st East Avenue
Tulsa, OK 74128-4609

CERTIFIED MAIL #5753
RETURN RECEIPT REQUESTED

RE: Comments and Notice of Deficiency
Expanded Site Investigation, dated January 16, 2001 (ESI)
Former Atlas Missile Site No. 7, Vernon, Texas
TNRCC Facility ID No. T1641

Dear Ms. Lawson:

The Texas Natural Resource Conservation Commission (TNRCC) has received the above referenced ESI received in our offices on April 19, 2001 under a cover letter dated April 16, 2001. Based on our review, the TNRCC cannot approve the ESI at this time. Please submit a revised report which addresses the enclosed comments and deficiencies.

An original and one copy of the written response to these comments and deficiencies must be submitted to the TNRCC at the letterhead address using mail code number MC-127. An additional copy should be submitted to the TNRCC Region 3 Office in Abilene.

Due to concerns for groundwater contamination, the TNRCC is requesting expedited reporting of groundwater sampling results and a schedule for additional site characterization. The deadlines are provided in the enclosure. The facility name, location and identification number(s) in the TNRCC reference line above should be included in your response.

Please note that it is the continuing obligation of persons associated with a site or facility to ensure that industrial solid wastes and/or municipal hazardous wastes are managed in such a way that it does not cause a discharge of wastes or an imminent threat of discharge, nor a nuisance or an endangerment to either human health or the environment as required by 30 TAC §335.4. Be advised that the burden remains upon the owner/operator to take necessary and authorized action to correct such conditions whenever they exist.

TNRCC letter dated September 24, 2001
ENCLOSURE
TNRCC Facility ID No. T1641

Comments and Deficiencies
Expanded Site Investigation, dated January 16, 2001 (ESI)
Atlas Missile Site No. 7

1. Non-residential land use and cleanup standards for the former missile site are acceptable to the TNRCC if the current owners and lessees give their concurrence in writing. The ESI indicates that the site is currently owned by the Northside Independent School District No. 905 of Vernon, Texas. The school district reportedly allows other organizations to use the site; however, the ESI does not indicate whether the other organizations are lessees. Regardless, the TNRCC requires that owner/operators agree in writing with any closure/remediation standard in excess of Risk Reduction Standard 1 (RRS 1, background/PQL) and a non-residential land use.

2. We agree with the conclusion on page 5-11 that additional testing to establish background is appropriate. In fact, background must be established for both soils and groundwater.

   As stated in the June 28, 2000 TNRCC Interoffice Memorandum, background must be set site-specifically. The background soil values listed in the Texas Risk Reduction Program (TRRP, 30 Texas Administrative Code (TAC) § 350) cannot be used at a site closing under the Risk Reduction Rules (RRR, 30 TAC §335, Subchapter S). Use of the background values listed in the table is for sites closing under the Risk Reduction Rules (RRR) that cannot establish site-specific background because all soils have been impacted by site activities. That is not the case at this site.

3. The extent of contamination in excess of background or Practical Quantitation Limits (PQL) must be defined under the RRR. The owner/operators and the TNRCC may accept that the entire site has been impacted; however, USACE must still establish that Constituents of Concern (COC) do not extend off-site in excess of background/PQL without consent of the adjacent landowner.

4. PQLs are still in excess of health-based limits for some constituents, particularly benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene. These COCs were seen in borehole BH07-S-00 in excess of the Method Detection Limit (MDL) and RRS 2 values. Other sample results were not reported down to the MDL as discussed in the TNRCC's last letter (screening procedure). As a result, the USACE cannot verify that the site meets the cleanup criteria for these COCs unless the lab still can provide estimated analytical results down to the MDL.

Regardless, the USACE must continue to test for the SVOCs listed in the Appendix H.2 table using analytical methods capable of attaining the lowest PQL possible. (See next Comment.)

5. In addition to the constituents listed as detected in soils on page 5-3, the USACE must define the extent of any COC in excess of RRS 1.

6. The extent of groundwater contamination, particularly TCE in the upper aquifer, is essential for compliance. The USACE must drill additional wells upgradient and downgradient of MW-08 to find not only the downgradient extent, but also the source of the contamination. The nearby cooling towers are an unlikely source for significant VOCs.

7. The deep well must be downgradient of the missile silo to provide any significant conclusions regarding the potential releases from the bottom of the silo. Geologic and hydrogeologic literature may present local groundwater flow trends for the San Angelos Formation (deep aquifer). It is likely even the deep aquifer is influenced by the Red River a few miles to the north.

8. The TNRCC suggests that the USACE consider leachate tests to determine site-specific soil to groundwater protection values (GWP), in accordance with 30 TAC §335.559(g).

9. Please conduct a survey of all wells within one half mile of the site. The survey should describe the location, well owners, well construction details, depth of well and screened interval(s), producing aquifer(s), and current status of the well. A map depicting the well locations should accompany the report.

10. Please depict the former missile site's drinking water supply well on subsequent maps, including all groundwater related maps. In addition, please indicate what the status of the well is.

11. The discovery of 140 micrograms per liter (ug/l) TCE in the upper aquifer is a very significant finding, particularly when the aquifer is a major drinking water supply for the area with wells at or near the site. Because of the potential immediate impact to human health and the environment, the TNRCC is requesting the following quick action:

    a. Immediately begin quarterly sampling of existing wells.

    b. Immediately sample any water supply wells for the site or immediately downgradient from the site.

TNRCC letter dated September 24, 2001
ENCLOSURE
TNRCC Facility ID No. T1641

c. Report groundwater sampling results to the TNRCC within 7 days of receipt of the laboratory results until further notice.

12. Please keep the Northside Independent School District No. 905 appraised of the situation as it develops. TCE groundwater

13. Further analyses of groundwater may be limited to those analytes previously detected in soils and groundwater and their degradation products.

14. Groundwater monitoring wells are necessary *directly* downgradient from the sources. The current monitor well array ended up being either side-gradient of upgradient of the sources. potential?

15. Please submit a schedule to complete characterization of the groundwater and any groundwater contaminant plume within 45 days after receipt of the first sampling results mentioned in Comment No. 11, above. TNRCC request that USACE give this site the priority needed to quickly define any threat posed by the groundwater contamination and to implement corrective action to mitigate that threat, as necessary.

16. The septic system should be considered a source of contamination requiring characterization. Please indicate whether the system is still in use.

17. The maximum chromium concentration was reported to be only 17.9 milligrams per kilogram (mg/kg) in Table 5-1, 12.4 mg/kg in Table I-3 (Appendix I) and 124 mg/kg in Table H.1. Lead, however, was consistently reported through the report. Please study your data and report it correctly and consistently.

18. We agree with the ESIs recommendation to define the extent of contamination. However, the USACE's proposal to define the extent using process knowledge and field screening must be verified by samples and analyses of sufficient high quality.

19. The TNRCC agrees with the ESI Recommendation to include previous data in the final report. The TNRCC's limited resources constrain us from compiling data from previous reports so that the facility can fully support its work and conclusions.

Questions concerning this letter should be directed to me at (512) 239-2577. When responding by mail, please submit an original and one copy of all correspondence and reports to the Corrective Action Section at Mail Code MC-127 with an additional copy submitted to the TNRCC Region 3 Office. The TNRCC Facility No. T1641 should be referenced in all submittals.

Sincerely,

512-239-2577
127

Geoffrey E. Meyer, Senior Project Manager
Team IV, Corrective Action Section
Remediation Division
Texas Natural Resource Conservation Commission

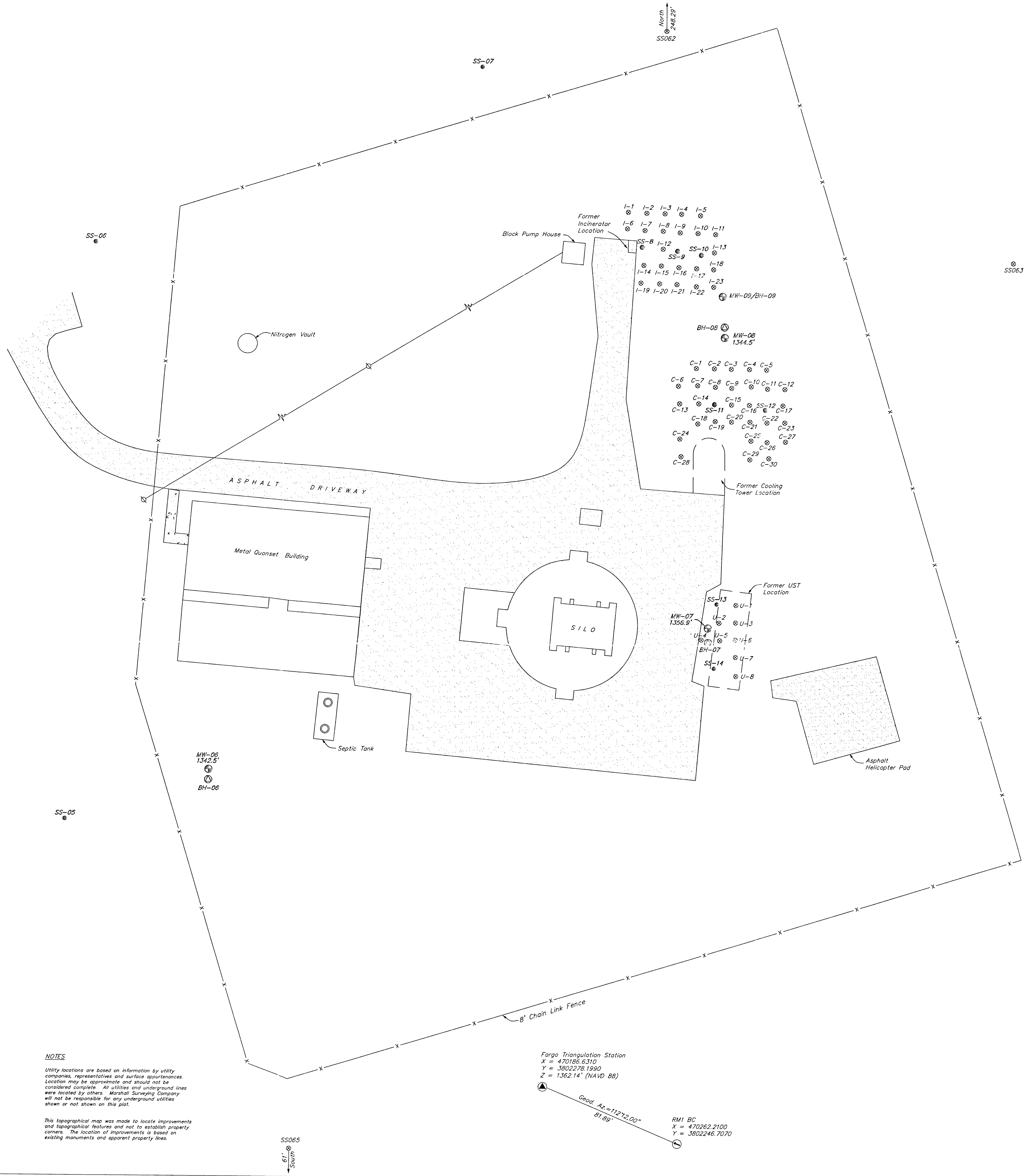
GM/gm

Enclosure

cc: Waste Program Manager, TNRCC Region 3 Office - Abilene

Appendix J

Detailed Site Feature Map



LEGEND

- Fence Line
- Overhead Electric
- Power Pole
- Man Hole
- Control Monument (Fargo)
- Reference Mark
- Soil Sample (DEMS 2001)
- Borehole
- Monitoring Well Location
- Soil Sample (MK 2000)
- Asphalt
- Concrete

NOTES

Utility locations are based on information by utility companies, representatives and surface appurtenances. Location may be approximate and should not be considered complete. All utilities and underground lines were located by others. Marshall Surveying Company will not be responsible for any underground utilities shown or not shown on this plat.

This topographical map was made to locate improvements and topographical features and not to establish property corners. The location of improvements is based on existing monuments and apparent property lines.

SOIL SAMPLE LOCATIONS					
I-1	X = 470230.944	Y = 3802772.103	C-1	X = 470269.899	Y = 3802684.003
I-2	X = 470241.321	Y = 3802771.633	C-2	X = 470280.261	Y = 3802683.943
I-3	X = 470251.623	Y = 3802771.454	C-3	X = 470289.889	Y = 3802683.695
I-4	X = 470260.965	Y = 3802771.230	C-4	X = 470300.156	Y = 3802683.629
I-5	X = 470271.708	Y = 3802770.472	C-5	X = 470310.111	Y = 3802683.374
I-6	X = 470230.524	Y = 3802762.801	C-6	X = 470259.803	Y = 3802674.018
I-7	X = 470240.353	Y = 3802761.902	C-7	X = 470270.673	Y = 3802674.328
I-8	X = 470250.653	Y = 3802761.607	C-8	X = 470280.874	Y = 3802673.509
I-9	X = 470260.266	Y = 3802760.740	C-9	X = 470290.159	Y = 3802673.013
I-10	X = 470270.330	Y = 3802760.406	C-10	X = 470301.187	Y = 3802673.895
I-11	X = 470280.465	Y = 3802759.889	C-11	X = 470310.758	Y = 3802672.684
I-12	X = 470250.657	Y = 3802751.349	C-12	X = 470320.514	Y = 3802672.562
I-13	X = 470279.825	Y = 3802749.464	C-13	X = 470260.526	Y = 3802664.158
I-14	X = 470239.842	Y = 3802742.135	C-14	X = 470271.385	Y = 3802664.241
I-15	X = 470249.723	Y = 3802741.848	C-15	X = 470290.104	Y = 3802663.674
I-16	X = 470259.599	Y = 3802741.016	C-16	X = 470300.198	Y = 3802663.502
I-17	X = 470269.657	Y = 3802740.495	C-17	X = 470319.438	Y = 3802663.278
I-18	X = 470279.435	Y = 3802739.947	C-18	X = 470270.891	Y = 3802652.861
I-19	X = 470238.297	Y = 3802732.016	C-19	X = 470280.828	Y = 3802654.276
I-20	X = 470248.788	Y = 3802731.681	C-20	X = 470290.136	Y = 3802654.091
I-21	X = 470258.616	Y = 3802731.369	C-21	X = 470300.554	Y = 3802654.051
I-22	X = 470269.631	Y = 3802730.170	C-22	X = 470310.432	Y = 3802653.697
I-23	X = 470279.552	Y = 3802730.005	C-23	X = 470320.570	Y = 3802653.693
U-1	X = 470293.255	Y = 3802550.714	C-24	X = 470260.708	Y = 3802644.265
U-2	X = 470283.723	Y = 3802540.613	C-25	X = 470301.165	Y = 3802643.410
U-3	X = 470293.148	Y = 3802540.785	C-26	X = 470310.655	Y = 3802642.635
U-4	X = 470273.604	Y = 3802530.995	C-27	X = 470321.008	Y = 3802642.949
U-5	X = 470284.189	Y = 3802530.671	C-28	X = 470261.455	Y = 3802634.293
U-6	X = 470293.072	Y = 3802531.094	C-29	X = 470300.565	Y = 3802632.832
U-7	X = 470293.191	Y = 3802521.198	C-30	X = 470311.652	Y = 3802633.518
U-8	X = 470293.403	Y = 3802510.480	MONITORING WELL LOCATIONS		
SS062	X = 470252.4425	Y = 3803060.4067	MW-06	X = 469996.9898	Y = 3802455.8655
SS063	X = 470448.810	Y = 3802744.568	MW-07	X = 470277.3748	Y = 3802537.5825
SS064	X = 470483.526	Y = 3802318.260	MW-08	X = 470286.1375	Y = 3802701.3908
SS065	X = 470044.185	Y = 3802181.213	MW-09	X = 470284.7852	Y = 3802724.6432

Surveying & Mapping By
MARSHALL SURVEYING COMPANY
P.O. Box 1221 Seminole , Oklahoma 74868 (405) 382-4488
CA 2261 LS Expires June 30, 2003

EXPANDED SITE INVESTIGATION PHASE 2
ATLAS MISSILE SITE No. 7

Monitoring Well, Borehole, and Surface Sampling Locations

CONTRACT No. DACA 56-01-D-2005 TASK ORDER No.1

WILLBARGER COUNTY, TEXAS

US ARMY CORPS OF ENGINEERS
TULSA DISTRICT
1645 SOUTH 101st EAST AVENUE, TULSA, OKLAHOMA

DEERINWATER ENVIRONMENTAL MANAGEMENT SERVICES, INC.

Drawn By: JLA & SRR	Checked By: JBM	Date: DECEMBER 30, 2001
SHEET 1 OF 1	Job No. 47401	Revised:

Appendix K

Well Bore
And
Completion
Diagrams
For
Monitoring Wells

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 3
Project Number: 4423-0220
Hole Number: BH 06

Project: AMS No. 7 ESI	Location: AMS No 7, Vernon Texas
Coordinates: (N) 7543291.90 (E) 1719524.29	Drilling Contractor: Horizon Drilling
Drill Make and Model / Drilling Method: Longyear BK-81 / HSA	Depth Top of Rock: 76.7 · Depth Casing & Size: NA · Hole Size: 8"
Elevation: 1365.0 (msl) · Angle from Vert. and Bearing: N/A	Depth Bottom of Hole: 79.0'
Water Level: 21.5' 18.3' (in core) (in open hole) · Fluid & Additives: Mud (100% bentonite) · Date Start: 7/19/00	Date Finish: 7/19/00 · Logger: Phil Hammons

ELEVATION	DEPTH BELOW SURFACE (ft)	SAMPLE: INTERVAL (Time)	SAMPLE: TYPE & NUMBER	SAMPLE: % RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, color, grain size, sorting (or gradation), plasticity, weathering, mineralogy, inclusions, angularity, moisture content.
	0	(0-0.5) 1200	AMS7-BH06-S-00 PID=0.6 chemical	5.0/5.0			SAND WITH SOME SILT (SM), moderate brown (5YR 4/4), v. fine grained, quartzose, 15% silt, dry (Upper several ft probable AF due to closure activities). PID=0.6
	5	(5.0-6.0) 1405	-05 PID=0.6 chemical	5.0/5.0			-grades to grayish orange (10YR 7/4). PID=0.6
	10	(10.0-11.0) 1415	-10 chemical PID=0.6	5.0/5.0			-laminated moderate reddish brown (10R 4/6) and very pale orange (10YR 8/2). PID=0.6
	15	(16.0-18.0) 1425	-18 (DA/QC) chemical PID=0.6	5.0/5.0			gradational. SAND (SP), moderate reddish brown (10R 3/4 4/6), v. fine grained, quartzose, no silt. PID=0.6
18.3' ▽ (in core)							Very silty sand (sm), moderate reddish brown (10R 4/6), very fine grained, quartzose, 30% silt, saturated
	20						-20.5' grades to silty sand (sm), light brown (5YR 5/6), 15-20% silt. PID=0.6
				3.0/5.0			SANDY CLAY (CL), pale yellowish brown (10YR 6/2), 20% v. fine grained sand, low plasticity, saturated
	25						

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 2 of 3
Project Number: 4423-0220
Hole Number: BH 06

Project: Ams No.7 ESI
Location: Ams No.7 Vernon, Texas

ELEVATION	DEPTH BELOW SURFACE (ft)	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE % RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION (Name, color, grain size, sorting (or gradation), plasticity, weathering, mineralogy, inclusions, angularity, moisture content.)
							CL (as above) gradational
				5.0/5.0			CLAYEY SAND (SC), light brown (5YR 5/6), v. fine grained, quartose, 15-40% clay, soft, saturated. PID=0.0
	30			4.8/5.0			SANDY CLAY (CL), very pale orange (10YR 8/2), 25-30% v. fine grained sand, stiff, abundant caliche nodules (2-3 mm diam.) PID=0.0
	35			4.0/5.0			Silty SAND (SM), mottled light brown (5YR 5/6) and very pale orange (10YR 8/2), v. fine grained, quartose, 10-20% silt, soft flowing sand. PID=0.0
	40			2.1/5.0			SAND (SP), light brown (5YR 5/6), v. fine grained, subrounded to subangular, soft, flowing sand. PID=0.0
	45			1.0/5.0			PID=0.0
	50			1.3/5.0			- grades to rounded grains. PID=0.0
	55						

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 3 of 3
Project Number: 4423-0220
Hole Number: BH06

Project: AMS No.7 ESI
Location: AMS No.7 Vernon, Texas

ELEVATION	DEPTH BELOW SURFACE (ft)	SAMPLE: INTERVAL (TIME)	SAMPLE: TYPE & NUMBER	SAMPLE: % RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, color, grain size, sorting (or gradation), plasticity, weathering, mineralogy, inclusions, angularity, moisture content.
				1.7/5.0			SAND (SP) as above PID=0.0
	60			1.6/5.0			PID=0.0
	65			?.0/5.0			PID=0.0 SILT (ML), light brown (5YR 6/4), hard
	70			2.6/5.0			SAND (SP) as above PID=0.0
	75	75.5-76.5 (1015)	AMST-BH06-S-76 chemical PID=0.0	3.2/~~5.0~~ 4.0 push			Top of Bedrock at 76.7' SANDSTONE, mod. red reddish brown (10R 4/6), very fine grained, trace silt faint low angle X-bedding, highly weathered.
							T.D. at 79.0'
	80						

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 4
Project Number: 4423-0220
Hole Number: BH-07

Project: AMS NO. 7 ESI
Location: AMS No. 7 / Vernon Texas
Coordinates: (N) 7?543371.68 (E) 1719805.76
Drilling Contractor: Horizon Drilling
Drill Make and Model /Drilling Method: Longyear BK-81
Depth Top of Rock: 85.5'
Depth Casing & Size: NA
Hole Size: 8"
Elevation: 1367.0 (MSL)
Angle from Vert. and Bearing: NA
Depth Bottom of Hole: 87.0'
Water Level: 11.3' (in open hole) 10' (in core)
Fluid & Additives: Insta-Vis Liquid Poly Polymer
Date Start: 7/17/00
Date Finish: 7/18/00
Logger: Phil Hammons

ELEVATION	DEPTH BELOW SURFACE (ft)	SAMPLE INTERVAL (Time)	TYPE & NUMBER	% RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, color, grain size, sorting (or gradation), plasticity, weathering, mineralogy, inclusions, angularity, moisture content.
		0-1.5' (1510)	AMS7-BH07-S-00 (Chemical) PID=0	3.3/5.0			SAND (SM), moderate reddish brown (10R 4/6), very fine to medium grained, 10% silt, 5% gravel, trace caliche nodules, Artificial Fill, soft. PID = 0.0'
	5	5-6' (1520)	-05 (Chemical) PID=0	1.8/5.0			(as above)
							approximate ----
							SAND (SP), grayish orange (10YR 7/4), medium to coarse grained, subrounded to rounded grains, quartzose, saturated at 10.0' in core, soft (AF?)
	10	(10-11') (1525)	-10 -05 (Chemical) PID=0	2.0/5.0			SAND with some silt (SM), mottled moderate reddish brown (10R 4/6) and light brown (5YR 5/6), very fine grained, trace medium grained, quartzose, 15% silt, soft
	15			2.5/5.0			PID = 0.0
							approximate ----
	20			5.0/5.0			CLAYEY SAND (SC), laminated light brown (5YR 5/6) and moderate yellowish brown (10YR 5/4), fine grained, quartzose, 30% fines, trace caliche nodules, stiff. PID = 0.0
	25						

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 2 of 4

Project Number: 4423-0220

Hole Number: BH-07

Project: AMS No. 7 ESI

Location: AMS No. 7, Vernon Texas

ELEVATION	DEPTH BELOW SURFACE (ft)	SAMPLE: INTERVAL	SAMPLE: TYPE & NUMBER	SAMPLE: % RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, color, grain size, sorting (or gradation), plasticity, weathering, mineralogy, inclusions, angularity, moisture content.
				5.0/5.0			(as above) PID=0.0
	30			5.0/5.0			trace gravel (up to 1" diameter), some caliche nodules and layers. PID=00
	35			3.8/5.0			SAND with some gravel (SW), moderate yellowish brown (10YR 5/4), fine grained, gravel up to 1.5" diameter, soft (36.0-36.8')
							CLAYEY SAND (SC), laminated, pale olive (10Y 6/2) and moderate yellowish brown (10YR 5/4), fine grained, 20% clay, stiff
							approximate
	40			4.0/5.0			SAND WITH SOME SILT (SM), mottled light brown (5YR 5/6) and grayish orange (10YR 7/4), v. fine grained, trace clay, flowing sands. PID=0.0
							approximate
	45			3.8/5.0			SAND (SP), light brown (5YR 6/4), fine grained, poorly graded, trace silt, quartzoze, flowing sands. PID=0.6
	50			4.0/5.0			(as above) Core barrel stuck in augers due to flowing sand on 50-55' run. Could not dislodge. Had to pull augers and rods out of hole to dislodge and go back in.
	55						

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Project Number: 4423-0220
Hole Number: BH-07

Project: AMS No. 7 ESI
Location: AMS No. 7, Vernon, Texas

ELEVATION	DEPTH BELOW SURFACE (ft)	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	% RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION (Name, color, grain size, sorting (or gradation), plasticity, weathering, mineralogy, inclusions, angularity, moisture content.)
	55–65			X		X	Drilled ahead without sampling from 55-65'. AT 65' added Insta-Vis liquid Polymer to mud pit to bring up cuttings and flush out HSA. (A CETCO product)
	60						
							From 65'-86', switched from continuous sampling to drive sampling with downhole hammer and 2' spoons (2" diameter)
	65			0.9/2.0'		SAND	SAND (SP) as above, flowing sands
				0.7/2.0'		SAND	PID=0.0
	70			0.4/2.0		SAND	
				1.0/2.0		SAND	PID=0.0
				2.0/2.0		SAND	
	75			1.3/2.0		SILT	SANDY SILT (ML), light brown (5YR 5/6), sand is v. fine grained (30%), trace clay.
				1.0/2.0		SAND	SAND (SP) as above. PID=0.0
	79–83			X		X	Drilled ahead without sampling from 79'-83', push
	80						
	85	845-85.5 (1740)	AMS7-BH07-S-85 (Chemical) PID=0.0	3.0/4.0		SAND	SAND (SP) as above

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 4 of 4
Project Number: 4423-0221
Hole Number: BH-07

Project: AMS No. 7 ESI
Location: AMS No. 7 Vernon, Texas

ELEVATION	DEPTH BELOW SURFACE (ft)	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE % RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION Name, color, grain size, sorting (or gradation), plasticity, weathering, mineralogy, inclusions, angularity, moisture content.
				3/4			SAND (SP) as above TOP OF BEDROCK at 85.5'
							SANDSTONE, moderate reddish brown (10R 4/6), silty, hard
							T.D. @ 87.0'
	90						
	95						

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 3
Project Number: 4423-0220
Hole Number: BH-08

Project: AMS No. 7 ESI	Location: AMS No. 7, Vernon Texas
Coordinates: (N) 7543550.53 (E) 1719815.19	Drilling Contractor: Horizon Drilling
Drill Make and Model / Drilling Method: Long year BK 81 / HSA	Depth Top of Rock: 80.5' ; Depth Casing & Size: NA ; Hole Size: 8"
Elevation: 1362.5 (msl)	Angle from Vert. and Bearing: N/A ; Depth Bottom of Hole: 85.0'
Water Level: 15.0' (in 18.5' in core open hole) ; Fluid & Additives: Mud / bentonite (100%)	Date Start: 7/20/00 ; Date Finish: 7/20/00 ; Logger: Phil Hammons

ELEVATION	DEPTH BELOW SURFACE (ft)	SAMPLE: INTERVAL (TIME)	SAMPLE: TYPE & NUMBER / PID	SAMPLE: % RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, color, grain size, sorting (or gradation), plasticity, weathering, mineralogy, inclusions, angularity, moisture content.
	0	7/20/00 0'-0.5' (1205)	AMS7-BH08-S-00 chemical PID=0.0	3.0/5.0			SAND (SP), light brown (5YR 5/6), v. fine grained, trace silt dry.
	approximate 4						SILTY SAND (SM), mod. reddish brown (10R 4/6), v. fine grained 15% silt, trace gravel (rounded <1" diameter), abundant caliche nodules (2-4" diam.).
	5	5.0-6.0' 7/20/00 (1250)	S-05 chemical	5.0/5.0			from 5-15' slight oil odor
	10	10.0-11.0' (1300)	S-10 chemical ; PID>2000 ppm (5-15')	5.0/5.0			grades to light brown (5YR 5/6) with some very pale orange (10YR 8/2) mottling
							trace caliche nodules (3-4 mm)
	15	15.0-16.0' (1325)	S-15 chemical	5.0/5.0			silt content increases to 30%
	18.5' in core	16.5-18.5' (1340)	S-18.5 chemical (15-17') PID 550 ppm				SANDY CLAY (CL), light brown (5YR 5/6), v. fine grained sand (35%), some caliche nodules, low plasticity.
	20		PID=0.0	3.5/5.0			
	25						

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 2 of 3
Project Number: 4423-0220
Hole Number: BH-08

Project: AMS No. 7 ESI
Location: AMS No. 7, Vernon TX.

ELEVATION	DEPTH BELOW SURFACE (ft)	INTERVAL	TYPE & NUMBER PID	% RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, color, grain size, sorting (or gradation), plasticity, weathering, mineralogy, inclusions, angularity, moisture content.
			PID 0.0	5.0/5.0			SANDY CLAY (CL) as above. 25-27' - grayish orange (10YR 7/4) with abundant caliche nodules (3-7mm diam). - grades to light brown (5YR 5/6) without caliche
	30		PID 0.0	5.0/5.0			- 30.0-32.2 grayish orange (10YR 7/4), abundant caliche nodules (3-7mm) - grades to l. brown (5YR 5/6)
	35		PID 0.0 ppm	4.0 ~~5.0~~/5.0			gradational. SILTY SAND (SM), light brown (5YR 5/6), v. fine grained, quartzose, well rounded, 20% silt, trace clay, soft, flowing sand
	40		PID 0.0	1.3/5.0			
	45		PID 0.0	1.0/5.0			SANDY SILT (ML), mod. orange pink (5YR 8/4), 15% v. fine sand, hard. SAND WITH SOME SILT (SM), l. brown (5YR 5/6), v. fine grained, quartzose, well rounded, 10% silt, flowing sand, soft
	50		PID 0.0	4.1/5.0			
	55						

MORRISON KNUD[illegible]EN CORPORATION
ENVIRONMENTAL SE[illegible]VICES GROUP

BOREHOLE LOG

Sheet 3 of 3
Project Number: 4423-0220
Hole Number: BH-08

Project: AMS No. 7 ESI
Location: AMS No. 7, Vernon Tx

ELEVATION	DEPTH BELOW SURFACE (ft)	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER PID	SAMPLE % RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION Name, color, grain size, sorting (or gradation), plasticity, weathering, mineralogy, inclusions, angularity, moisture content.
			PID ϕ.ϕ	1.0/5.0			SAND WITH some SILT (SM) as above
	60		PID ϕ.6	0.6/5.0			
	65		PID ϕ.6	2.2/5.0			VERY SANDY SILT, l. brown (5YR6/4), [illegible]0% v. fine gr. sand, stiff.
							SAND (SP), light brown (5YR 6/4), v. fine grained, quartzose, rounded flowing sand.
	70		PID ϕ.6	1.2/5.0			
	75	(80.1-80.5') 1730	S-80(EB) chemical PID=ϕ.ϕ	1.0/5.0			Top of Bedrock at 80.5'
	80			2.8/5.0			SANDSTONE, Mod. reddish brown, v. fine grained, faint low angle x-bedding, highly weathered
							T.D. at 85' bgs

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 4
Project Number: 4423-0220
Hole Number: BH-09

Project: AMS NO. 7 ESI	Location: AMS No. 7, Veron Texas
Coordinates: (N) 7543566.68 (E) 1719814.85	Drilling Contractor: Horizon Drilling / Peterson Drilling
Drill Make and Model / Drilling Method: Gardner-Denver 1500 / Mud Rotary; Longyear BK-81 / Air Rotary / Mud Rotary	Depth Top of Rock: ~~84'~~ 80.5'
Depth Casing & Size: Isolation Casing 91' 8 5/8" (steel)	Hole Size: 0-95' (12 1/4") 95'-210' (7 3/4")
Elevation: ~~NR~~ 1362.82 (MCL)	18 8' 3/4" was added to Bentonite mud; Angle from Vert. and Bearing: Borehole Reamed w/ Drilltech D40K
Depth Bottom of Hole: 210'	Water Level:
Fluid & Additives: 0-95' - Bentonite Mud; 95'-88' - None	Date Start: 7/12/00
Date Finish: 8/03/00	Logger: PHIL HAMMONS

ELEVATION	DEPTH BELOW SURFACE (ft)	SAMPLES: INTERVAL	TYPE & NUMBER	% RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, color, grain size, sorting (or gradation), plasticity, weathering, mineralogy, inclusions, angularity, moisture content.
	0						Drilled from 0.0' to 88' bgs with 4.25" tricone; logged cuttings (see log of adjacent Borehole BH08 for lithologies)
	10						
	20						▽ approximate depth to groundwater
	25	N/A	N/A		N/A		
	30						
	40						
	50						

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Project Number: 4423-022C

Hole Number: BH-09

Project: AMS No. 7 ESI

Location: AMS No. 7, Vernon Texas

Elevation	Depth Below Surface (ft)	Sample Interval	Type & Number PID	% Recovery	Standard Penetration Test Results 6"-6"-6" (N)	Symbolic Log	Soil Description (Name, color, grain size, sorting (or gradation), plasticity, weathering, mineralogy, inclusions, angularity, moisture content.)
							see log of adjacent Borehole BH08 for lithologies
	60						
	70						
	80	Boring isolation casing					Top of Bedrock at 80.5' (based on contact encountered in adjacent BH08)
							weathered bedrock
							unweathered bedrock at 84.0' based on drilling change
	90	91.0'		5.0/5.0	N/A		SANDSTONE, moderate reddish brown (10R 4/6), v. fine grained, quartzose, prominent low angle cross-bedding, hard dry
							Reamed pilot (4.25") borehole with 12.25" tricone bit from 0.0' to 98' bgs. Set 8 5/8" steel casing to 91' bgs and grouted in place.
							Begin Air Coring at 98.0' on 7/19/00
	100						SILTSTONE WITH some sand, moderate reddish brown (10R 4/6), sand is v. fine grained (10%), dry, possible water bearing fractures
			0.0	6.5/10	NA		SILTY SANDSTONE, moderate reddish brown (10R 4/6), sand is v. fine grained, quartzose, 25-30% silt, damp, low angle x-1
							approximate
	110			5.7/10	NA		SANDSTONE, pale reddish brown (10R 5/4) with pale olive (10Y 6/2) mottling, v. fine grained, quartz and rk fragments, abundant elongate shale clasts in areas, prominent low angle x-bedding, some (2-10 mm) solution cavities, some filled w/ crystals.

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 3 of 4

Project Number: 4423-0220

Hole Number: BH-09

Project: Ams No. 7 ESI

Location: Ams No. 7, Vernon Texas

ELEVATION	DEPTH BELOW SURFACE (ft)	SAMPLE: INTERVAL	SAMPLE: PID	SAMPLE: % RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, color, grain size, sorting (or gradation), plasticity, weathering, mineralogy, inclusions, angularity, moisture content.
							as above
			0.0	5.7/10	NA		SANDY SHALE, pale reddish brown (10R 5/4) with pale olive (10Y 6/2) mottling – sand is v. fine grained (20-30%)
							– – – approximate – – –
							SANDSTONE, Pale reddish brown (10R 5/4), v. fine grained, quartzose, low angle X-bedding, moderately cemented.
	120		0.0	6.8/10	NA		122'-128' - clayey
	130		0.0	8.7/10	NA		131.5-134.0 mottled pale olive (10Y 6/2) with abundant shale clasts (from 116-138' - loss ≈ 100 gallons to Fm.)
	140		0.0	4.9/10	NA		138.5'-140.2' mottled pale olive (10Y 6/2) with abundant shale clasts 140.2'-142.9' - weakly cemented
	150		0.0	3.0/10	NA		weakly cemented, no noticeable x-bedding
	160		0.0	6.0/10	NA		159.2'-160.7' - mottled pale olive (10Y 6/2) with abundant shale clasts 160.7'-164.0' - weakly cemented (from 138-168' loss ≈ 160 gallons to Fm.) Flushed out pit prior to co[illegible] Drillers added InstaVis liquid Polymer at 168' 168.0'-170.6' well cemented, abundant solution cavities (1-4mm) prominent X-bedding (low angle)
	170			6.0/10	NA		

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

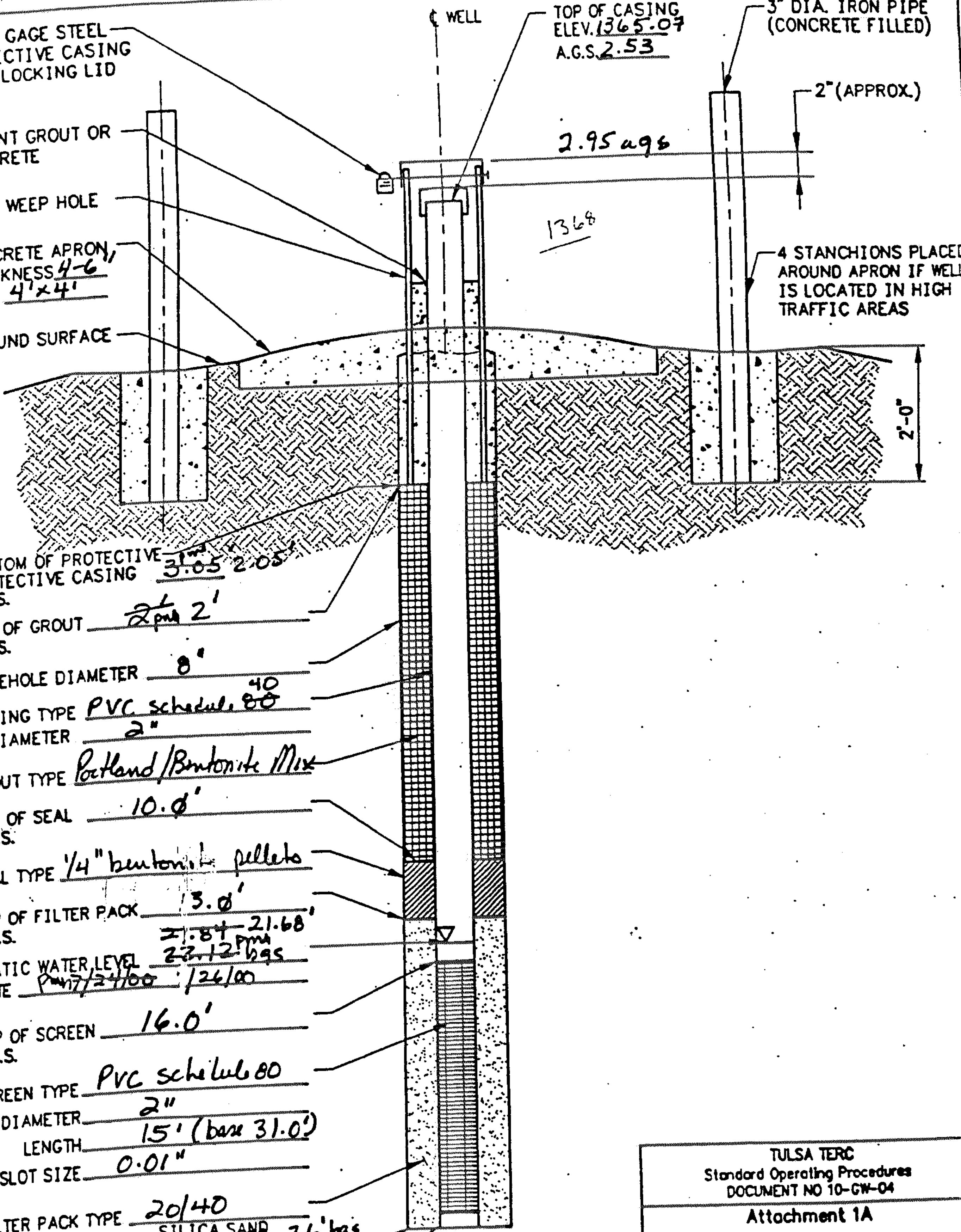
BOREHOLE LOG

Sheet 4 of 4
Project Number: 4423-022C
Hole Number: BH-09

Project: AMS No. 7 ESI
Location: AMS No. 7, Vernon, Texas

ELEVATION	DEPTH BELOW SURFACE (ft)	SAMPLE: INTERVAL	SAMPLE: ~~TYPE & NUMBER~~ PID	SAMPLE: % RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, color, grain size, sorting (or gradation), plasticity, weathering, mineralogy, inclusions, angularity, moisture content.
							170.5-171.5 - weakly cemented
			0.7	6.0/10	NA		SILTSTONE, greenish gray (5G6/1), shaley in areas, sand content (5%) weakly cemented
							approximate
							SHALE, moderate reddish brown (10R4/6) with thin bands of greenish gray (5GY4/1)
							178'-180' - soft, wet
	180						180'-181.8' very hard, dry
							181.8-184' - alternating soft and hard, ~~dr~~ damp and dry
			2.6	6.1/10	NA		
							moderate reddish brown (10R4/6) with occassional greenish gray (5GY4/1) spots, very hard, dry, fractures in areas (possible water bearing).
	190		>2000	4.8/5			
			>2000	5.0/5.0			
	200		>2000	3.7/5.0			
			NR	2.1/5.0			low battery on PID, lamp will not light
			NR	1.4/2.0			T.D. at 210' bgs
	210						
	220						
	230						

MW06



BOTTOM OF PROTECTIVE PROTECTIVE CASING B.G.S. ~~3.05~~ 2.05'

TOP OF GROUT B.G.S. ~~2~~ pmk 2'

BOREHOLE DIAMETER 8"

CASING TYPE PVC schedule ~~80~~ 40

& DIAMETER 2"

GROUT TYPE Portland/Bentonite Mix

TOP OF SEAL B.G.S. 10.0'

SEAL TYPE 1/4" bentonite pellets

TOP OF FILTER PACK B.G.S. 13.0'

STATIC WATER LEVEL ~~21.84~~ 21.68' pmk 22.12 bgs

DATE ~~pmk 7/24/00~~ /26/00

TOP OF SCREEN B.G.S. 16.0'

SCREEN TYPE PVC schedule 80

DIAMETER 2"

LENGTH 15' (base 31.0')

SLOT SIZE 0.01"

FILTER PACK TYPE 20/40 SILICA SAND
10 bags (50lb bags)

BOTTOM OF WELL B.G.S. pmk 31' .26' bgs 31.0' 4'
33.79-2.53

BOREHOLE TOTAL DEPTH B.G.S. 31.5'

NOT TO SCALE

TULSA TERC
Standard Operating Procedures
DOCUMENT NO 10-GW-04

Attachment 1A

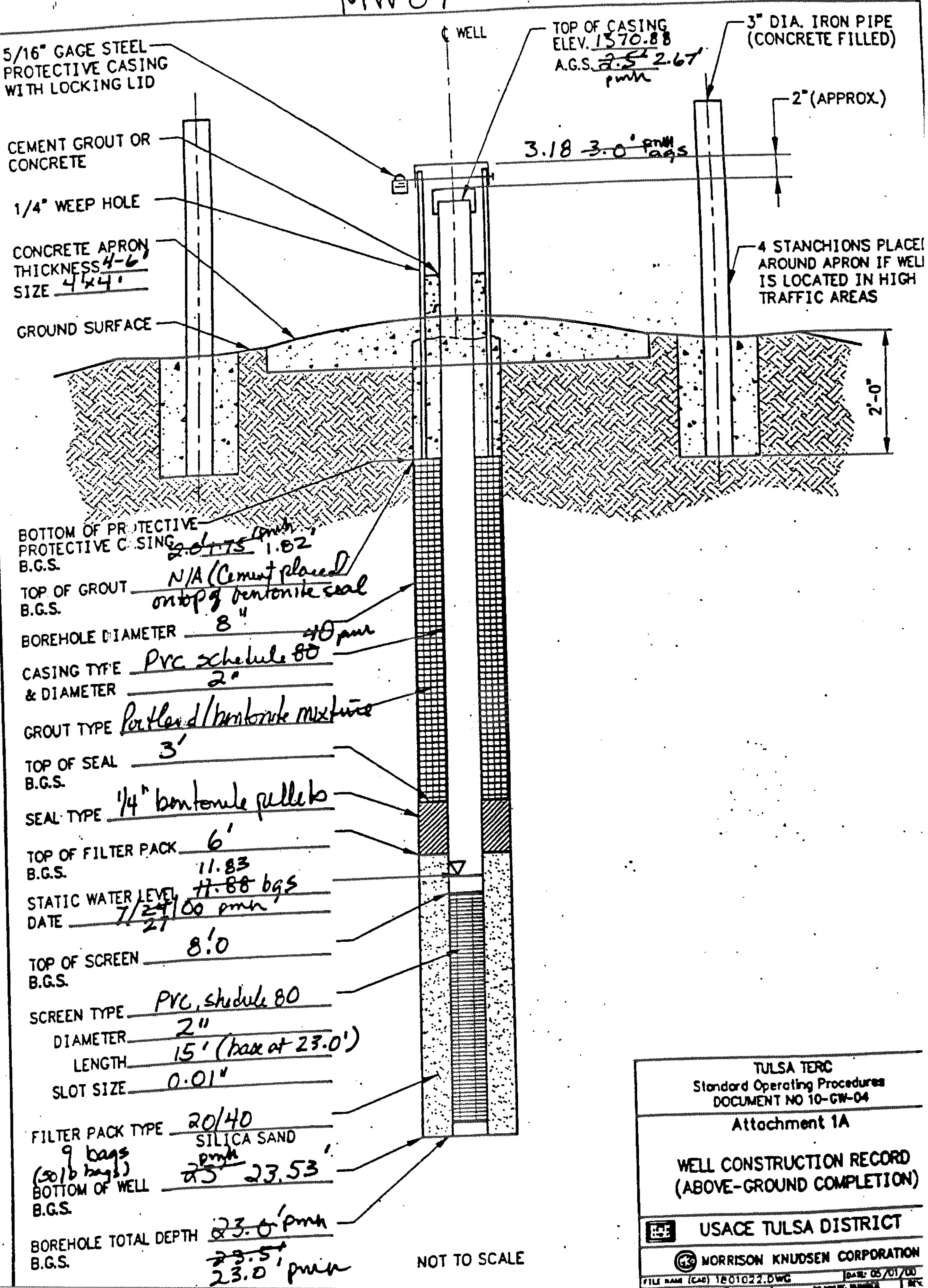
WELL CONSTRUCTION RECORD (ABOVE-GROUND COMPLETION)

USACE TULSA DISTRICT

MORRISON KNUDSEN CORPORATION

FILE NAME (CAD) 1801022.DWG DATE: 05/01/00

MW 07



TULSA TERC
Standard Operating Procedures
DOCUMENT NO 10-GW-04

Attachment 1A

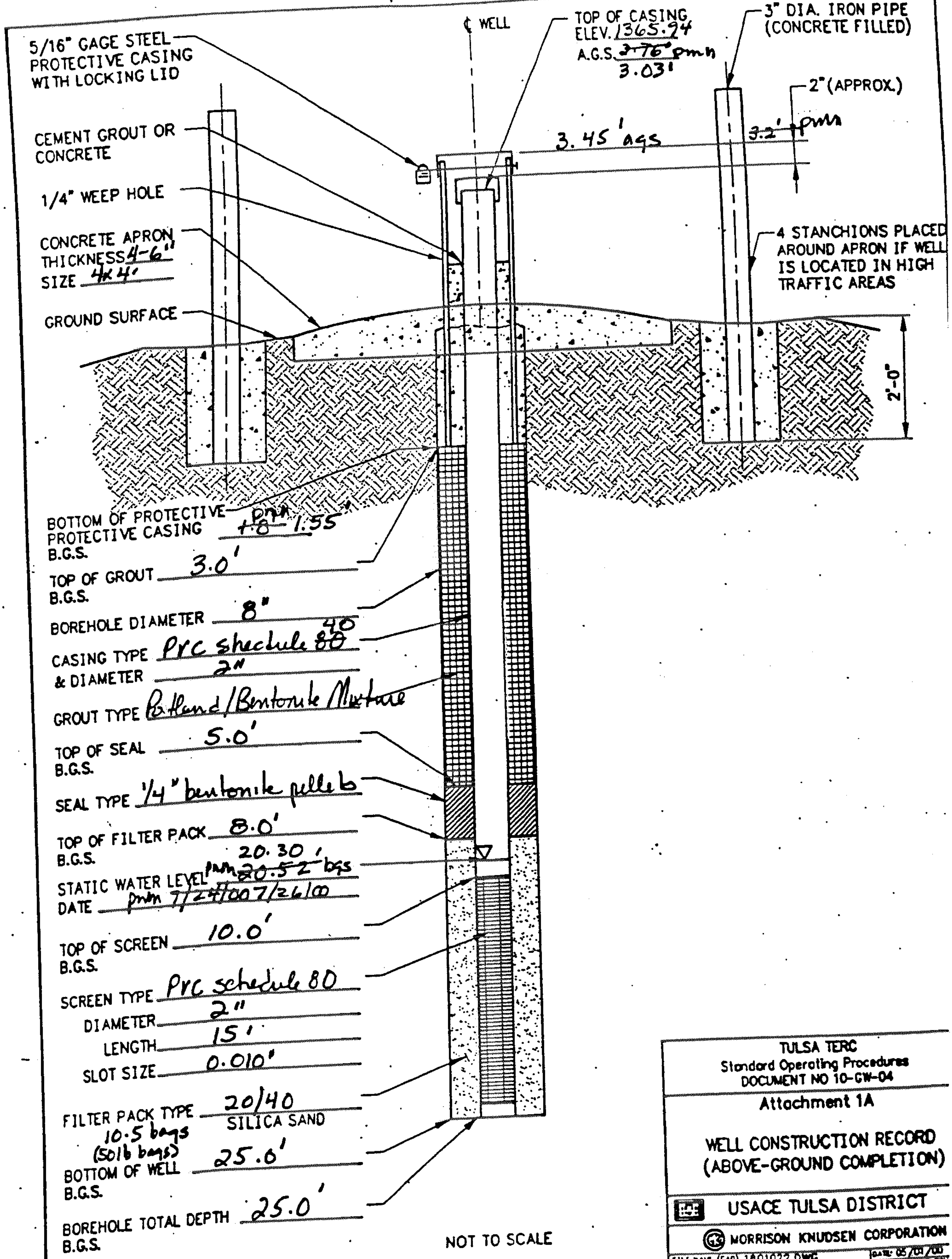
WELL CONSTRUCTION RECORD
(ABOVE-GROUND COMPLETION)

USACE TULSA DISTRICT

MORRISON KNUDSEN CORPORATION

FILE NAME (CAD) 1801022.DWG DATE: 05/01/00

MW 08



TULSA TERC
Standard Operating Procedures
DOCUMENT NO 10-GW-04

Attachment 1A

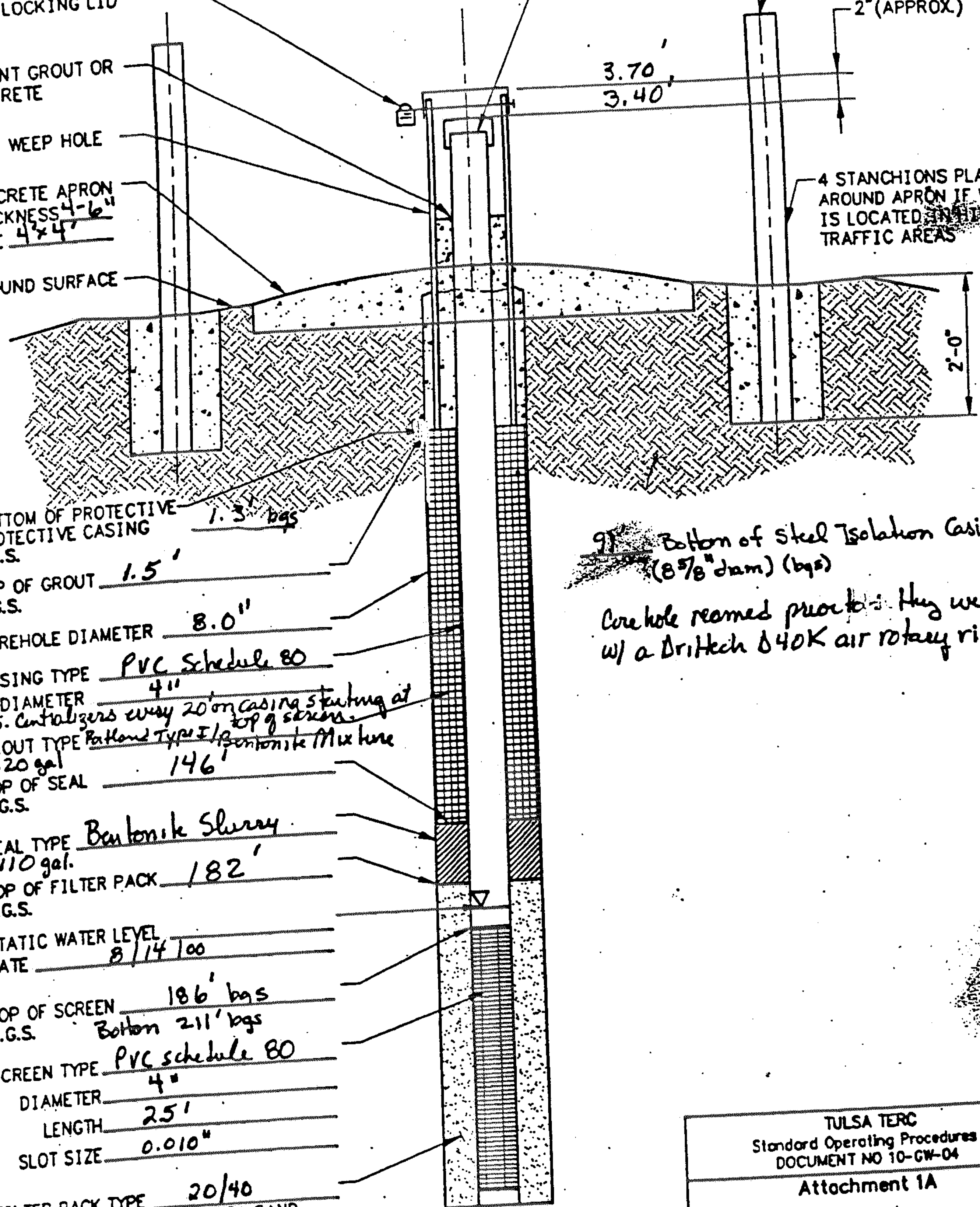
WELL CONSTRUCTION RECORD
(ABOVE-GROUND COMPLETION)

USACE TULSA DISTRICT

MORRISON KNUDSEN CORPORATION

FILE NAME (CAD) 1801022.DWG DATE: 05/01/00

MW09



5/16" GAGE STEEL PROTECTIVE CASING WITH LOCKING LID

CEMENT GROUT OR CONCRETE

1/4" WEEP HOLE

CONCRETE APRON THICKNESS 4-6"

SIZE 4'x4'

GROUND SURFACE

℄ WELL

TOP OF CASING ELEV. 1366.22

A.G.S. 3.40'

3" DIA. IRON PIPE (CONCRETE FILLED)

2" (APPROX.)

3.70'

3.40'

4 STANCHIONS PLACED AROUND APRON IF WELL IS LOCATED IN ... TRAFFIC AREAS

2'-0"

91' Bottom of Steel Isolation Casing (8 5/8" diam) (bgs)

Core hole reamed prior to ... the well w/ a Dritech D40K air rotary rig

BOTTOM OF PROTECTIVE CASING B.G.S. 1.3' bgs

TOP OF GROUT B.G.S. 1.5'

BOREHOLE DIAMETER 8.0"

CASING TYPE PVC Schedule 80

& DIAMETER 4"

S.S. Centralizers every 20' on casing starting at top of screen.

GROUT TYPE Portland Type I / Bentonite Mixture

320 gal

TOP OF SEAL B.G.S. 146'

SEAL TYPE Bentonite Slurry

110 gal.

TOP OF FILTER PACK B.G.S. 182'

STATIC WATER LEVEL

DATE 8/14/00

TOP OF SCREEN B.G.S. 186' bgs

Bottom 211' bgs

SCREEN TYPE PVC schedule 80

DIAMETER 4"

LENGTH 25'

SLOT SIZE 0.010"

FILTER PACK TYPE 20/40 SILICA SAND

15 bags

BOTTOM OF WELL B.G.S. 211.5

BOREHOLE TOTAL DEPTH B.G.S. Cored to 210', Reamed to 220'

NOT TO SCALE

TULSA TERC
Standard Operating Procedures
DOCUMENT NO 10-GW-04

Attachment 1A

WELL CONSTRUCTION RECORD (ABOVE-GROUND COMPLETION)

USACE TULSA DISTRICT

MORRISON KNUDSEN CORPORATION

FILE NAME (CAD) 1801022.DWG | DATE: 05/01/00

Appendix L

Record Review

Comments on. . .aft Final Report
For The Expanded Site Investigation Phase II
Former Atlas Missile Site No. 7
Vernon, Texas

Reviewer: Dave Jones, ARMY/FUDS Section Tulsa District, U.S. Army Corps of Engineers
Respondent:

1. Respondent concurs (C), Does not Concur (D), or takes Exception (E).
2. Commentor Agrees (A) with response, or Does not Agree (D) with response.

Comment #	Section/Page	Paragraph/ Line	Comment	C, D, E[1]	Response	A or D[2]
1	GENERAL		Proofread, spell check, word search for consistency, etc. entire document carefully.	C	Corrected	
2	2.3.1 / 7	1st ¶/ line 4	Reword " AMS sites were declared to be excessive".	E	Reference taken from SOW.	
3	2.4 / 10	3rd ¶/ line 3	Were water levels measured to the nearest 1/10th inch or foot?	C	Corrected to 1/100th foot	
4	Figure 2	Page11	Label as Figure 2. Add groundwater flow direction arrow. Change MW-05(?) to MW-08. Increase font size for well names, water levels and contour intervals. Will this figure be in color for final report?	C	Corrections and arrows added. Figure will be in color.	
5	3.1	General	Number subsections as done in the rest of the report instead of using bold titles alone.	C	Subsections added.	
6	3.1	General	Add a section to briefly discuss the 1999 demolition(s).	E	Only details of demolition given in MK Expanded Site Investigation report. Information in our report reflects what was reported in MKs report.	
7	3.1	General	During discussions of previous investigations, give specific numbers of how many samples were taken.	C	Tables were added to reflect numbers of samples collected for the MK investigations. Data for previous investigations N/A.	
8	3.1 / 12	2nd ¶/ line 2	Reword to reflect "… to determine if there was a release or potential of hazardous…"	C	Corrected	
9	3.1 / 12	Last ¶	For the 1995 USACE investigation, what are the "background ranges"? Were screening levels used to help determine that "no further action " was warranted?	E	Corrected text to reflect statement was taken from the Jan 2001 Mk report and raw data was not provided to DEMS.	
10	3.1 / 13	2nd ¶	See previous comment; how was the TRPH explained?	C	See response to comment no. 17	
11	3.1	General	At the end of section 3.0, after discussions on past sampling results, state that complete sample results are on record and available for review at the Tulsa District COE.	C	Text was added to reflect referenced reports were available for review at the USACE, Tulsa District Office.	
12	3.1	General	On the detailed site map (APP J), which would be better in color, show all past borehole, monitoring wells, and sample locations.	E	Not all information was provided to DEMS.	
13	4.0 /16	2nd bullet	Change "analyzed" to analysis and identify what metals were tested for..	C	Corrected	
14	Figure 3	Page 17	From the legend, it is somewhat unclear if all the sampling points, boreholes, and wells were installed by MK 2000.	C	Corrected	
15	4.1.1 / 21	1st ¶	Explain better that each sample came from a 10 square foot area block off of the grid system.	C	Added text to reflect.	
16	4.1.2 / 21	1st ¶	See previous comment. It may be clearer to refer to each sampling area as a block not a grid. (Figures 3.1, 2, 3, 3.1A, 2B, and 3C could be edited to also reflect this).	E	All reference to sample locations, in the approved work plan, has been grids, to stay consistent it should stay grids for this report. On future work plans an adjustment can be made.	
17	4.1.4 /25	2nd ¶	In the future, the water level should be measured and recorded each time stabilization parameters are recorded. Also, the flow rate needs to be recorded at each reading as well as the total volume of water remover prior to sampling.	C	Will note for future reference.	

Comment #	Section/Page	Paragraph/ Line	Comment	C, D, E[1]	Response	A or D[2]
18	4.1.4	General	An additional paragraph needs to be added to this section discussing: Were these dedicated pumps that were left in each well for future use? Was there one pump used per well or was one pump moved from well to well? If one pump was moved from well to well, what were the decon procedures used?	C	Third paragraph describes the setting of each pump. Additional text was added to discuss decon of pumps.	
19	4.1.5 / 25		Reference that survey coordinates are located on the map in App. J.	C	Corrected	
20	5.0 / 27	General	Need a brief discussion somewhere in this section discussing the rational for using the screening levels used (TNRCC RRS-II residential) for this investigation. Why did MK use industrial and DEM use residential?	C	Added text to various sections discussing RRS-1 and RRS-II and Texas Specific Background Concentrations.	
21	Table 5.2	Page 28	Provide a separate table or additional columns in Table 5.1 listing the screening levels (TNRCC RRS-II residential and GWP) for each parameter.	C	Corrected - added table.	
22	5.2 / 30	1st ¶ and Table 5.2	Were any of these results listed above screening levels (RRS-II and GWP)? If not, state so.	C	Added text to reflect results of screening levels	
23	5.2 / 30		A discussion on the PCB results needs to be included in this section.	C	Added test	
24	5.2.1 / 30 and 3.1 / 14	General	These two sections are confusing when comparing them to each other. How did MK use screening levels in the 2001 ESI? It appears they used Background Concentrations for the metals and TNRCC RRS-II (industrial) for the other parameters??	C	Added text to both sections explaining what MK used for screening values	
25	5.2.1 / 30	2nd ¶	A discussion on the comparison of the analytical results to MSC for GWP needs to be added.	C	Added test to this section and text to section 6.1 to discuss GWP	
26	Figures 3.1A, 3.2B, and 3.3C	Pages31 - 33	Section 5.2.1 states these figures give concentrations for both phases of the ESI – are they? It appears only phase II is listed, but the numbers don't quite match table 5.2 probably due to a rounding off of numbers; list all results as the actual lab reported results.	C	Corrected to reflect only ESI Phase II data on figures. Table corrected to match figures.	
27	5.3 / 34	1st ¶	List all the parameters tested for.	C	Added information.	
28	5.3 / 34	last ¶	Also mention other parameters tested for that had no detections.	C	Added information	
29	5.3.1	General	Number subsections (metals, VOC, etc.) instead of simply bolding them.	C	Subsections added.	
30	5.3.1 / 35	3rd ¶/ lines 4 and 5	Vinyl Chloride would make a fifth VOC found in phase I but not found in phase II.	C	Corrected text to reflect.	
31	Table 5.2.1	Page 36	Table 5.2 and the text list toluene also in MW09.	C	Added 0.0028J to MW09 Toluene	
32	6.0	General	Number subsections (soil, groundwater, etc.) instead of simply bolding them.	C	Subsections added.	
33	6.1 / 37	Soil section's last sentence and table	What were the PCB concentrations for the background soils? One background sample had .170ppm; about a dozen surface samples had detections – some below and some above this background sample. More information needs to be given before saying that PCBs in surface soils are above background.	C	Corrected – All background concentrations for PCBs were ND.	
34	6.1 / 37	Soil section - General	How do the site's 4 background samples compare to the Texas Specific Background Concentrations. Also, a small discussion may be needed to address the fact that the 4 background samples were collected within a few hundred feet of the site; are these truly representative of background samples?	C	Added text to reflect background results with the Texas Specific Concentrations.	
35	6.1 / 37	Soil section - General	How the sample results compared to the MSCs RRS-II needs to be discussed. (Both residential and GWP)	C	Added text.	

Comment #	Section/Page	Paragraph/ Line	Comment	C, D, E[1]	Response	A or D[2]
36	6.1 / 38	1st ¶ / last line	Mention other parameters where no detections were the result.	C	Corrected	
37	5.0 and 6.0	General	Is there enough data to warrant a discussion concerning specific COPCs for each of the three sites within AMS #7 and/or what past practices at the cooling tower, incinerator, etc. would result in these contaminants being present - lead, zinc, PCBs, TCE, etc.	E	Exact activities not previously documented for each area. Adding text would only be speculation.	
38	7.0 / 39	2nd ¶ / line 5	Explain better what is meant by "to establish GWP".	C	Added text to Section 7.	
39	7.0 / 39	2nd ¶ / line 9	Explain better "greater than 3 feet".	C	Added text to Section 7.	
40	7.0 / 41	1st ¶	Even though closure can now be met under RRS II-Res, future investigations may discover higher concentrations of contaminants that could not meet closure under RRS II-Res but be met under RRS II-Ind. Would it not be wise to reclassify the site, especially if TNRCC would agree?	E	DEMS does not feel that an attempt should be made to classify this site as industrial. It is not up to the TNRCC to agree or disagree. It would have to be accepted to the current landowner. If current landowner agreed this change in land status would have to be filed at the land office thus permanently changing sites	
41	7.0	General	In TNRCC's letter (16 Jan 2001), they mention that" background must be established for both soils and groundwater". How is background for water to be accomplished?	E	This activity would best be performed during the RI phase of investigation.	
42	7.0	General	In TNRCC's letter (16 Jan 2001), they mention that a "septic system should be considered as a possible source of contamination..." Has this been addressed?	C	Yes the septic system should be considered as a possible source but DEMS does not recommend taking action at this time. This is due to the distance from the septic tank to Monitoring Well 08. Monitoring well MW06 is much closer to the septic tank and is unaffected.	

Reviewer Name: Crain, Mike

Discipline Geology

CX Project Review No. 67990

Date: 02/05/2002

Project Location Vernon, TX

Document Name: Draft Final Expanded Site Investigation Report, Phase II, Former Atlas Site 7

Comment # 1: Table 2.5, pg 10 – Please clarify why the Total Depth numbers in this table are so much different that the Total Depth figures given in Table 2.4? It appears that the Total Depth figures in Table 2.5 are actually the depth to water below top of casing.

Concur – Clarified Table 2.5 to reflect last column is depth to groundwater.

Comment # 2: Sec. 4.1.4, 4th parag, 1st sentence – It appears that the first word of the first sentence should be "During" instead of "After".

Concur - Corrected

Comment # 3: Sec. 4.1.4, 5th parag, pg 25 – What was considered excessive drawdown? From the well sampling records, it appears that MW-07 had 7.49 feet of drawdown (16.65' to water before purging, 24.14' after sampling). That is a large amount of drawdown by low-flow sampling standards. The report should evaluate whether that had any effect on the quality of the data from that well. In addition, the drawdown and purge volumes for that well on the sampling record do not make sense. Based on the purge rate, approximately 2.5 gallons of water was purged prior to sampling. The amount of drawdown recorded after sampling (7.49 ft) represents about 10 gallons of water in the casing and annulus (based on a 10" boring and 30% porosity in the filter pack). The difference in those two volumes appears to be much more than what would have been pumped during the sample collection period. The significance of all this is that it appears that all the water removed from the well came from storage in the casing and filter pack and not from the formation, which raises doubt about the validity of the data from that well. Since there is going to be additional groundwater investigation done at the site, this isn't a major problem that would change the basic decisions that are being made. However, it is something that needs to be taken into consideration when planning the next phase of work. It may be necessary to use different sampling protocol for this well to get reliable results. A good alternative might be to use passive diffusion bag samplers in all the wells to overcome the problems with low recharge rates. They are inexpensive and easy and would probably work well in this situation. The HTRW-CX can provide assistance in their use if needed. Also, the area represented by MW-07 probably shouldn't be assumed to be unaffected by the chlorinated solvent plume until reliable data can be collected that shows that it is, in fact, clean.

Concur – This well did exhibit a significant draw down. The well diameter is 8" and not 10" thus reducing the total amount of water present in the filter pack and well tubing. Total sample required by the laboratory was approximately 10 liters. Regardless DEMS does concur that some of the water sampled must have come from the filter pack. The well was not recharging at a sufficient rate to keep up, even with the low flow sampling. Per the approved Work Plan if the well would have pumped completely down then the alternate sampling technique was bailing with a VOC tip. It is DEMS opinion that sampling with the low flow sampler even with the exhibited draw down was preferable to bailing. DEMS feels that the over all potential effect is reduced by the fact that VOC and SVOC samples were collected first, per the sampling and analysis plan, before the majority of the draw down occurred. Also given the fact that previous sampling events have not detected any of the primary COPCs in this well the potential that any were missed during this sampling event is reduced. DEMS agrees that examination of sampling procedures for future events should be reviewed.

Comment # 4: Table 5.2.1 – A previous Table (5.2) show toluene in MW-09 at 0.0028 mg/l during the Phase II ESI investigation but Table 5.2.1 shows that sample as ND for toluene. Please clarify and correct the table.

Concur – Corrected.

Comment # 5: Sec. 7.0, 1st bullet – Please clarify what is meant by "downgradient" in the next-to-last sentence of the bulleted section. Does it mean topographically lower or downgradient in terms of groundwater flow direction? Since these are shallow soil samples in the vadose zone, the direction of groundwater flow won't have any effect on the distribution of contaminants in the soil zone being sampled. I recommend just sampling the locations of the three or four most contaminated surface samples in each area.

Concur – The use of the word downgradient is in reference to surface topography. Added text to reflect.

Comment # 6: Sec. 7.0, 2nd bullet – I agree with the recommendation to do additional groundwater sampling at more locations and to investigate the entire thickness of the shallow aquifer. However, there may be more efficient ways to accomplish that than to start by drilling and installing additional monitoring wells. It might be possible to use direct push methods to either collect some groundwater samples or to measure VOC concentrations in-situ. Based on the boring logs from the monitoring wells, the soil may be too hard or contain too much caliche for a direct push rig to penetrate deep enough but a DPT rig with a hammer might be able to do it. A geologist or contractor with more local knowledge might be able to make a recommendation on the feasibility of using direct push. Groundwater samples could either be collected using a groundwater sampling probe, small diameter temporary wells could be installed, or a tool such as the Hydrosparge could be used to measure VOC concentrations in-situ. The low aquifer yield may cause a problem for sample recovery but the sample volumes are very small so that aspect should work o.k. These are all screening tools that could be used to determine where permanent wells need to be located so the number of wells that have to be installed and incorporated into a monitoring program is minimized but the shallow plume is still adequately defined. Without some type of screening step such as this, there is not much to go on to locate monitoring wells and it will likely take more than one additional phase of well installation to define the plume. I would discourage the project team from focusing too much on MW-08 as the "center" of further investigation efforts because the available data doesn't do much to identify how or where the release may have occurred and some of the current data may not be too reliable (see comment 3 regarding MW-07). I think it is important that you keep a fairly broad view of the site groundwater at this point.

Concur – DEMS is currently working with the USACE on procedures to best identify the location of the TCE contamination prior to selection the locations of the addition monitoring well.

Comment # 7: Sec. 7.0, 4th bullet – I agree that additional sampling of the deep aquifer is needed. However, it will be necessary to install at least two additional wells in the deep aquifer to be able to determine which direction groundwater flows. I recommend doing additional literature research and possibly contacting either the USGS or State geological survey water resources people for information on regional flow patterns in the San Angelos aquifer before locating the wells. One well should be located as close to the silo as practical since the silos themselves have been found to be the source of TCE at some other Atlas sites, presumably due to leaks from the sump at the bottom of the silo.

Concur – DEMS agrees that drilling only one additional well to the deep aquifer will not establish a gradient based solely on wells drilled on site. The primary purpose in drilling only one well, is to follow the recommendations of the TNRCC as stated in their letter dated September 24, 2001. DEMS agrees that research is need in establishing a better understanding on regional flow patterns for this aquifer. DEMS also agrees that the well should be drilled close to the silo. However, DEMS feels it important that the well not be placed within the fill material surrounding the silo. The primary purpose of this well should be the examination of the deep undisturbed aquifer directly down gradient to the silo.

Reviewer Name: Cheryl Groenjes

Discipline: Chemistry

CX Project Review No. 67990

Date: January 15, 2002

Project Location: Fmr. Atlas Missile Site No.7, Vernon, TX

Document Name: Draft Final Report for Site-Wide ESI Phase II

Comment # 1: p.15, 2nd paragraph. Define to what depth the borehole samples were sampled from.

Concur – Added table detailing subsurface sample collection depths.

Comment # 2: p.17, fig.3. Clarify the following items on the figures: Background sample locations, Ground water flow direction (NW?); two boreholes are noted as BH08 – and no BH 07.

Concur – Maps included in the text of the report do not cover a large enough area to identify the locations of the background samples. Additional text has been added stating the location of the background samples can be found on the large scale map in Appendix J. Ground water flow direction arrows has been added to Figure 2. BH numbers have been checked and corrected.

Comment #3: p.21, 4.1.2. Suggest noting depths of the surficial samples within this sampling description.

Concur – Depths have been noted.

Comment #4: p.22, 4.1.3 and p.34, 5.3. Clarify here if water measurements obtained during DEMS 2000 sampling effort confirm the GW flow direction for the shallow aquifer identified in the MK report (NW direction).

Concur - However, text was not added to section 4.1.3 or 5.3 but instead to Section 2.4, which specifically deals with the site hydrology and discusses the relationship between past gradient interpretations and results from the current study. Text was added on page 10 comparing past to current gradient directions.

Comment #5: p.28-29, tbl 5.2.

a. The values given on the tables differ slightly from those given on site figures: 3.1A, 3.2B, and 3.3C, for the same sample results. Rounding error is not applicable, for the number of significant figures given. Results should agree to avoid confusion or making it appear that there are multiple results.

   Concur – Table has been corrected, data presented on figures and table match.

b. Suggest the 'ND' be expressed as < (lab reporting limit) to clarify the sensitivity achieved.

   Concur – Information added to tables.

Comment #6: p.29, 1st paragraph. Identify the grid locations for these samples (**C**-12, and **C-28**).

Concur – Added text to identify grid locations with sample ID numbers.

Comment #7: p.29, 2nd paragraph. Correct sample number designations given as 'ss'.

Concur - Corrected

Comment #8: p.34, 5.3.1 Disagree that the metals data show any trends of decreasing between the MK and DEMS sampling efforts. The differences shown here are so slight, they are basically equivalent. Suggest it be stated that data is comparable, therefore very supportive amongst the two sampling efforts.

Concur - Edited text removing reference to decreasing trend.

Comment #9: p. 34, tbl 5.2 (AGAIN?) Suggest the 'ND' be expressed as < (lab reporting limit) to clarify the sensitivity achieved.

Concur - Added information to tables

Comment #10: p.35, 5.3.1-VOCs. Disagree that the data show any trends of increasing between the MK and DEMS sampling efforts. The differences shown here are so slight, they are basically equivalent. Suggest it be stated that the VOC detections found in the MK effort was confirmed the following year with the DEMS sampling/analysis done.

Concur –Remove reference to trends.

Comment #11: p.35, 5.3.1-SVOCs. Correct typo for chemical compound: BIS (2-ethylhexyl)phthalate.

Concur - Corrected

Comment #12: p.36, tbl 5.2.1.

a. Detections noted within text are identified as 'ND' on the table: VC for MW-9 (MK), and toluene for MW-9 (DEMS).

   Concur – Corrected

b. Add MSC values for cis-1,2-DCE (0.07) and trans-1,2-DCE (0.1).

   Concur – Corrected

c. Typo for BIS (2-ethylhexyl)phthalate.

   Concur – Corrected

d. There is no basis given within App G (data validation report) why the values for TCE, cis-1,2-DCE, trans-1,2-DCE, and toluene should be J-flagged. The detections are large enough that most are above the low level standard (PQL) also. Investigate the rationale behind this 'estimation' qualifier being applied, and summarize it within section 5.1, or delete qualifier from table.

Exception – Page 4 of the validation report under Accuracy reports that for ground water samples MW07, MW09, MW09A, and MW06 the surrogate recovery for D-8 Toluene exceeded the upper recovery limit. Per the EPA rules for data validation of detected volatile organics these samples were J qualified as estimated.

Comment #13: p.37, tbl 6.1. Include PCB values found in background samples that are being used as the basis for determining impact onsite.

Concur – Added line to table listing PCB background results.

Comment #14: p.38, 6.1.

a. Refer to comment 11 as it pertains to the MSC screening levels are ALL project COPCs.

Concur - Corrected

b. Several confusing statements are noted within this paragraph that require editing. Also correct the numerous typos.

Concur – Edited text and corrected typos.

Comment #15: p.38, 6.2.

a. A background set composed of only four samples is extremely limited, and should be qualified as such.

Exception – The number of background samples collected was approved in the work plan as being sufficient for this situation. DEMS agrees this may not be sufficient in other situations.

b. Suggest emphasizing here that the results presented in figures3.1A, 3.2B, 3.3C show the extent of surficial contamination has been established and is very limited as shown in previous figures.

Concur – Text has been added to reflect suggestion.

Comment #16: p.39, 7.0, 1st bullet.

a. Suggest the leachate testing be restricted to metals analysis ONLY and be taken from the grids with higher detections: one for the incinerator (around I6 or I7) and one for the cooling tower areas (around C24 or C13). The hydrophobic nature of PCBs as well as the low levels found do not support the data need to evaluate leachability from precipitation. The lead and zinc concentrations in the UST area are much lower than the other areas and do not support this leachability assessment either.

Concur – Text is being added to reflect suggested test. Also, DEMS is working with the CORP Tulsa District in planning the next sampling event.

b. The contractor must provide the rationale to support the proposed subsurface sampling.

Concur – Additional text is being added.

c. Clarify site topography conditions that apply that would require additional surface samples to determine contaminant runoff potential. For the necessity of this should be scrutinized. The levels of lead, zinc, and PCBs and extent of the areas impacted are minor - and the mobility is being assessed from subsurface samples and leachability testing protocols already.

Concur – Much of the AMS site is elevated relative to the surrounding topography. This includes the former locations of the cooing tower, incinerator and UST sites. These are several water runoff areas that have not been examined during previous investigations.

Comment #17: p.39, 7.0, 2nd bullet. The more serious concern is the detections of TCE in the GW. Due to the lack of definitive sources for these solvents, and the limited GW data available, suggest some type of field analytics be considered for use onsite to gather some information to help direct the sampling efforts while minimizing the number of mobilizations needed to understand the N/E of the TCE contamination. The TCE levels identified (140ppb) are sufficient to allow the consideration of several varieties of field techniques for the VOC.

Concur – DEMS is working the CORP in planning the next subsurface sampling/drilling events.

Comment #18: General. Several spelling and grammatical errors were noted during the review that require a technical editor.

Concur – Correcting

Comment #19: Appendix G. Clarify what the recovery limits for the MSD and LCS were for mercury. If the LCS failed, corrective action should have been taken to remedy the issue per method requirements. Clarify why this was not done.

Concur – Corrected Validation report to clarify that rejected mercury data was due to MS/MSD biased low.

Reviewer Name:	Walker, Terry L.
Discipline	Risk Assessor
CX Project Review No.	67990
Date:	02/05/2002
Project Location	Former Atlas Missile Site No. 7, Vernon, TX
Document Name:	Draft Final ESI Phase II

Comment # 1: Section 3.1. Please include references to the tables and figures in Section 5 for the results of the previous investigations. Suggest bringing relevant data into this section as several subsections indicate that they report "results."

Concur – Added additional tables to Section 3 for previous investigations and added text to section 5 referencing section three tables.

Comment # 2: Section 5.2.1, last sentence. Please revise this sentence to reflect Comment #2 from the TNRCC.

Concur – Removed last sentence completely and added text to both section 5.2 and 5.2.1 to reflect background sample information and its relationship to the Texas Specific Background concentrations.

Comment # 3: Section 6.1, page 38. On page 4 of Appendix H, the following "GW-res" values are presented: 1,1-DCE, 7.0E-03 mg/L; cis-1,2-DCE, 7.0E-02 mg/L; and trans-1,2-DCE, 1.0E-01 mg/L. This conflicts with the sentence that states non values are available. Please correct.

Concur – Corrected text to reflect screening level concentrations.

Comment # 4: General. There are numerous places with typos (most not identified via spell-check) or improper use of terms. Please carefully proof this document.

Concur – Reviewing and correcting.

Comments on DRAFT FINAL REPORT, EXPANDED SITE INVESTIGATION, PHASE II, FORMER ATLAS MISSILE SITE #7

Reviewer: Carol Wies, CESWT-EC-EF, Tulsa District, Corps of Engineers, HTRW Design Center, Engineering and Construction Division

Respondent: DEERINWATER ENVIRONMENTAL MANAGEMENT SERVICES, INC.

Responses: C=Respondent concurs, D=Respondent does not concur, E=Respondent takes exception
Commentor A=Agrees with response, or D=Does not agree with response.

Comment #	Section/Page	Paragraph/Line	Comment	C,D,or E	Response	A or D
0.25	General	Appendices	The laboratory reports need to be included in an appendices. I realize that it is quite monumental, but they still need to be included.	C	Added an Appendix to report containing all validated data.	
0.5	Table of Contents		List Figures and Tables at the end of the TOC for easy reference.	C	Added to Table of Contents	
1	1.1 / 5	2^{ND} / 5^{th}	Refer to the "water" samples as "groundwater". Needs changed in 2 places on this line.	C	Corrected	
2	1.2 / 6	Last line	There is a double period at the end of the sentence.	C	Corrected	
3	2.4 /9	1^{st} / 9^{th}	Is this used for a "public" water supply? What is the definition of "public"? Does the City of Vernon or other community use this? Does referring to it as "public" have regulatory implications, or definitions?	C	Changed text to read "water supply well"	
4	2.4 / 9	2^{nd} / 4^{th}	"activates" should be "activities".	C	Corrected	
5	9	Table 2.4	I tried to determine where the elevations listed under the column "filter pack interval" were obtained. The only thing I could locate in previous reports was for MW-6, filter pack was 13 ft bgs, for MW-07, 6 ft. bgs. Please verify that the elevations listed in this table are accurate. In regards to this comment, putting well diagrams from the previous report in an appendices would be extremely helpful. In fact, I had to fax well diagrams to a couple of the reviewers.	C	These numbers were calculated from elevations and depths given in on MKs completion diagrams. Numbers were used to figure volume of water in filter pack. They are not needed for this section of the report so they were rempved.	
6	2.4 / 10	2^{nd} / last	The last sentence states that one monitor well is not sufficient to establish gradient, and this is			

			true, but TNRCCs comment 7 to the ESI Phase I mentions that hydrogeologic literature may present local groundwater flow trends. Did DEMS look into this? This may be more of an issue for the next Phase!!	E	Detailed literature was not review for this SOW. It was not needed for this smpling event.	
7	11	Figure ?-?	Please provide a title such as FIGURE 2, and list the figures in the table of contents,. Also, well designation (i.e. MW-06) needs to be enlarged to be readable. GW contour labels also need to be enlarged. In the title block, the title "CONTOURED POTENTIOMETRIC SURFACE…" needs to be larger, while the USACE and Tulsa District could be smaller. In the title "POTENTIOMETRIC" is spelled incorrectly.	C	Corrections made to maps.	
8	3.1 / 12	1st / last	"preformed" should be "performed".	C	Corrected	
9	3.1 / 13	2nd / last	Is "octylthalate" spelled correctly? I think there is an extra Y in this sentence.	C	Word misspelled. Missing a p (octylpthalate)	
10	3.1 / 12	5th / 1st	No VOCs were detected in the samples, but…The VOC analysis was determined to be invalid during the data validation, due to bubbles in the water samples. This should be reported as such, due to the VOCs detected in all subsequent sample events.	C	Added text to reflect data validation problems.	
11	3.1 / 10	2nd / 3rd	If the phthalate was attributed to sampling gloves, then it should not say "site soils" it should say "soil samples".	C	Corrected	
12	3.1 / 14	Last / 1st	This sentence is worded awkwardly, i.e. "…from collected soil samples near…", I think it would sound better if it said "… from soil samples collected near…"	C	Corrected	
13	3.1 / 15	Last / 3rd	When typing ".140", type as "0.140", this is for clarity.	C	Sentence removed.	
14	17	Figure 3 legend	Why are there 2 different symbols for borehole locations. Deep and shallow, please clarify on legend.	C	Corrected on ledgend	
15	18	Figure 3.1	A cross reference to soil sample numbers would be helpful.	C	A cross reference to soil numbers is included in Table 5.1	
16	19	Figure 3.2	See comment #15.	C	A cross reference to soil numbers is included in Table 5.1	

17	20	Figure 3.3	See comment #15.	C	A cross reference to soil numbers is included in Table 5.1	
18	4.1.2 / 21	1st / 1st	"represent" should be "represented".	C	Corrected	
19	4.1.2 / 21	1st / 5th	Replace "grab" with "discrete", meaning they were not composited, if this is the case.	C	Corrected	
20	4.1.3 / 22	1st / 15th	"accumulation" should be "accumulated".	C	Corrected	
21	4.1.4 / 24	3rd / 8th	Change "..every two-three minutes…" to "…every two to three…"	C	Corrected	
22	28	Table 5.2	Should be titled 5.1. As there is no previous table in Section 5. But there is another Table 5.2 on page 34.	C	Corrected	
23	28	Table 5.2	Rather than "ND", the table should show less than detection limit… i.e. <10. Also would like to see the concentrations that exceed the applicable regulatory limits highlighted, or bold.	C	Information added to text.	
24	5.2 / 29	1st / 1st	"…other then…" should be "…other than…"	C	Corrected	
25	5.2 / 29	1st / 4th	Change "…and .2…" to "…and 0.2…" for clarity.	C	Corrected	
26	5.2 / 29	1st / last	Change ".5" to "0.5"	C	Corrected	
27	5.2 / 29	FYI	All 7 QA samples were below the RL 0f 0.0096 mg/kg.	C	Corrected	
28	5.2 / 29	2nd / last	Change "…AMS0722025-032…" to "…AMS0722025 through 032…" if this is what is meant, as it is written they look like just a long string of numbers, with not much meaning.	C	Corrected	
29	5.2 / 30	1st / 1st	Change "…unusable date…" to "…unusable data…"	C	Corrected	
30	5.2 / 20	1st / 4th	Would the non-rejected mercury data be biased low? I would be happy to provide the QA results for mercury, if this would be of value.	C	Corrected	
31	5.2.1 / 30	2nd / 2nd	"…elevated level…" should be "..elevated levels…"	C	Corrected	
32	5.2.1 / 30	2nd / 3rd	"COCPs" should be "COPCs".	C	Corrected	
33	5.2.1 / 30	2nd / 3rd	Rather than going straight to RRS2, it should be state that the RRS 1 was exceeded, therefore the results were compared to RRS2.	C	Text added to reflect.	
34	5.2.1 / 30	Last / last	Is the 10 mg/kg for PCB results? Please add what analyte the 10 mg/kg pertains to.	C	Corrected	
35	5.2.1 / 30	Last	Do groundwater protection standards need to be	C	Text added.	

			discussed?			
36	31	Figure 3.1A	Where are PCB results? Can a line showing the limits be added?	C	Added information.	
37	34	Table 5.2	Rather than ND, the <detection limit # should be used. Also, not all analytical results are shown, therefore the sentence above should explain why there particular results were chosen to be reported. (because the were above regulatory limit? Above reporting limit? Please clarify they these were the only results reported in this table.	C	Information added to tables and text.	
38	36	Table 5.2.1	See comment #34 <DL vs ND and why these results?	C	Added information. Corrected footnote to read N/A – Not Analyzed. A * symbol was added to represent not action level provided.	
39	6.1 / 37	2nd/ 2nd	"PCP's" should be "PCBs"?	C	Corrected	
40	6.1 / 38	1st / 4th	Toluene is spelled incorrectly. Also the validation report stated that this was biased high. That should probably be mentioned.	C	Added text.	
41	6.2 / 38	1st / 3rd	Cooling is spelled incorrectly.	C	Corrected	
42	7.0 / 39	2nd / 9th	This sentence states "…greater than 3 d Feet." What should the depth be? 4 ft? 10 ft? Be more specific.	C	Added text to reflect a depth of 3 feet.	
43	7.0 / 3.9	2nd	What analysis should be run on the soil samples?	C	Added information.	
44	7.0 / 39	3rd	What analysis should be run on the groundwater samples? Groundwater can be one word.	C	Added information	
45	7.0 / 40	1st / 2nd	After "..well construction details.." add (if available), as private wells may not have the construction details available.	C	Corrected	
46	7.0 / 40		Are there any other parameters that should be checked for like …natural attenuation parameters, bio-remediation parameters…?	E	These options should be considered when the RI phase of investigation occurs.	
47	7.0 / 40	d)	I wish DEMS would recommend analytes to be tested for.	C	Corrected. Added text to reflect.	

CESWT-EC-EF 17 January 2002

MEMORANDUM FOR CESWT-EC-ER (C. Wies)

SUBJECT: Comments to Draft Final Report for Expanded Site Investigation Phase II at Former Atlas Missile Site No. 7, Vernon, Texas (December 2001)

1. Enclosed are comments generated from the review of the subject document listed above.

2. For additional assistance or information, please contact me at extension 7442.

Encl

GREG WILLIAMS
Sr. Chemist, Army/FUDS Section

CF:
CESWT-EC-E
CESWT-EC-EF

Comments on Draft Final Report for Expanded Site Investigation Phase II
At Former Atlas Missile Site No. 7, Vernon, Texas (December 2001)

Reviewer: Greg Williams CESWT-EC-EF
Tulsa District, U.S. Army Corps of Engineers; HTRW Design Center

Respondent:

1. Respondent concurs (C), Does not Concur (D), or takes Exception (E).
2. Commentator Agrees (A) with response or Does not Agree (D) with response.

Comment #	Section/Page	Paragraph/Line	Comment	C,D, or E[1]	Response	A or D[2]
1	Sect. 3/p.14	Pgh. 6/ln. 1	Reword sentence as follows: "Polychlorinated biphenyls (PCBs) were also detected in soil samples collected from areas near the incinerator, cooling tower, and USTs locations."	C	Corrected	
2	Sect.5.1/pg. 27	Pgh.1/ln.9 – 10	Reword/clarify sentence ('The data evaluated is adequate to evaluate …").			
3	Sect. 5/ Tables	General	List less than Minimum Detection Level value (use a numerical value) in table instead of ND (use < MDL value or < IDL value, when appropriate).	C	Information added to tables.	
4	Sect.5.2/p.28 – 29	Table 5.1	See comment # 3. Also, label table as Table 5.1, as designated on bottom of p.27.	C	Added information to tables. Added label.	
5	Sect. 5.3/p. 34	Table 5.2	See comment # 3.	C	Added information to Tables.	
6	Sect.5.3.1/p.36	Table 5.2.1	See comment # 3.	C	Added information to Tables.	
7	Appendix G/	General	Discuss how TA-TN's control limits and method control limits compare or relate to each other and compliance issues (where appropriate throughout the document).	C	Added text to Data Validation Report	

Comment #	Section/Page	Paragraph/Line	Comment	C,D, or E[1]	Response	A or D[2] -
8	Appendix G	General	Use "data were" instead of "data was" throughout the document (data are plural).	C	Corrected, added text.	
9	App. G 3.1/p.4	Pgh.4/ln.7	Replace "was" with "were" in last sentence.	C	Corrected, added text.	
10	App. G 3.1/p.5	Pgh.4/ln.3 – 5	The definition for the "J code" in this sentence is not consistent with "J qualifier" definition on p. 2 of the report. Explain how to distinguish its use and applicability when reviewing the data.	C	Corrected, added text.	
11	App. G 3.2/p.6	Pgh.2/ln.4	The use of the "J code" in this sentence is not consistent with the use of "J code" on p.5. Provide a means to distinguish them when reviewing the data.	C	Corrected, added text.	
12	App. G 3.2/p.6	Pgh.3/ln.4	See comment # 11.	C	Corrected, added text.	
13	App. G 3.2/p.6	Pgh.7/ln.2	See comment # 11.	C	Corrected, added text.	
14	App. G 3.2/p.6	Accuracy	See comment # 7. Discuss how TA-TN's lower control limit, historical control limit, control limit, etc., compare with the method limits and compliance issues.	C	Corrected, added text.	
15	App. G 3.2/p.7	Precision	See comment # 14.	C	Corrected, added text.	
16	App. G 3.3/ p.7 &8	Accuracy/Precisio n	See comment # 14.	C	Corrected, added text.	
17	App. G 3.4/p.8	Accuracy/Precisio n	See comment # 14.	C	Corrected, added text.	
18	App. G 3.5/p.9	Accuracy/Precisio n	See comment # 14.	C	Corrected, added text.	
19	App. G 3.6/p.10	Accuracy/Precisio n	See comment # 14.	C	Corrected, added text.	
20	App. G 3.7/p.10	Accuracy/Precisio n	See comment # 14.	C	Corrected, added text.	
	App. G	Accuracy/Precisio	See comment # 14.	C	Corrected, added text.	

Comment #	Section/Page	Paragraph/Line	Comment	C,D, or E[1]	Response	A or D[2]
21	4.1/p.11 & 12	n				
22	App. G 4.2/p.13	Accuracy/Precision	See comment # 14.	C	Corrected, added text.	
23	App. G	Table 4 & 5	See comments # 10 & 11.	C	Corrected, added text.	